



mitsubishi 1993

SEMICONDUCTORS

RF POWER SEMICONDUCTORS

DATA BOOK



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CONTACT ADDRESSES FOR FURTHER INFORMATION

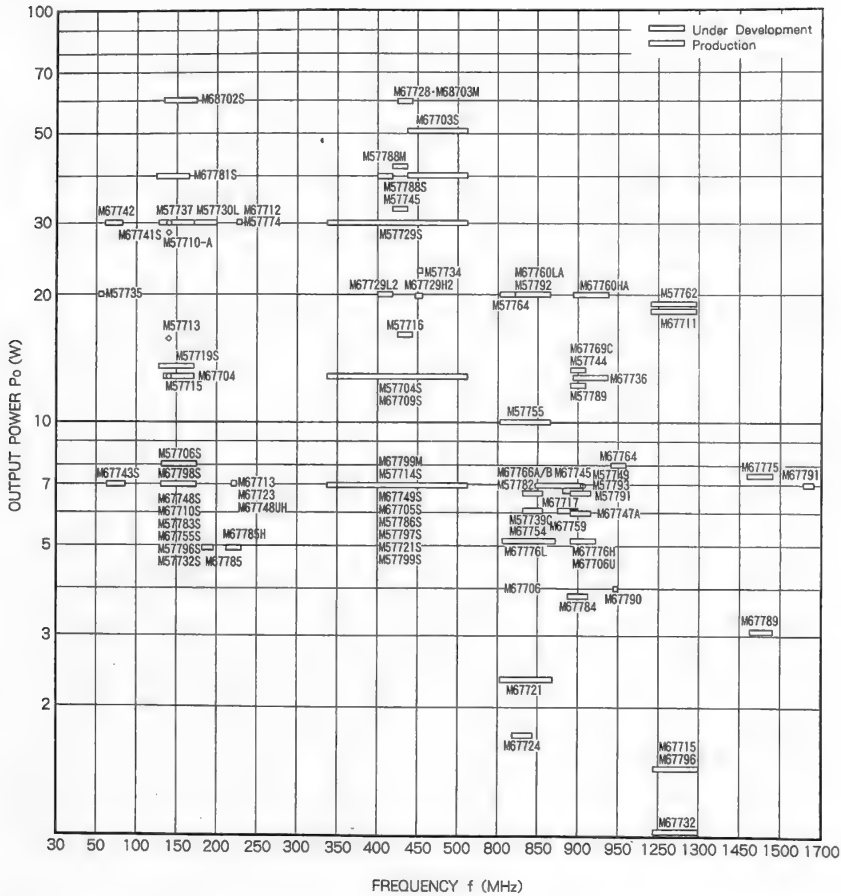
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M67781L	2-275	2SC2539	3-95	2SC4525	3-212
M67781H	2-278	2SC2540	3-98	2SC4526	3-216
M67783	2-279	2SC2609	3-101	2SC4624	3-220
M67784	2-281	2SC2627	3-104	2SC4838	3-223
M67785	2-283	2SC2628	3-107	■ ANTENNA SWITCHES	
M67785H	2-286	2SC2629	3-110	MI105	4-3
M67789	2-287	2SC2630	3-113	MI204	4-5
M67790	2-289	2SC2694	3-116	MI301	4-7
■ HIGH FREQUENCY		2SC2695	3-119	MI303	4-10
HIGH POWER		2SC2797	3-122	MI308	4-13
TRANSISTORS		2SC2798	3-124	MI402	4-16
2SC730	3-3	2SC2799	3-126	MI407	4-19
2SC741	3-6	2SC2904	3-129	MI809	4-22
2SC908	3-9	2SC2905	3-132	■ HYBRID ANTENNA	
2SC1324	3-13	2SC2932	3-135	SWITCHES	
2SC1729	3-17	2SC2933	3-137	MD001	5-3
2SC1945	3-20	2SC3001	3-140	MD001A	5-6
2SC1946	3-23	2SC3017	3-143	MD001AL	5-9
2SC1946A	3-26	2SC3018	3-145	MD001H	5-12
2SC1947	3-29	2SC3019	3-148	MD001HL	5-16
2SC1965	3-32	2SC3020	3-152	MD001L	5-20
2SC1966	3-35	2SC3021	3-155	MD003	5-23
2SC1967	3-38	2SC3022	3-158	MD003A	5-26
2SC1968	3-41	2SC3101	3-161	MD003H	5-29
2SC1968A	3-44	2SC3102	3-163	MD004	5-32
2SC1969	3-47	2SC3103	3-166	MD004H	5-35
2SC1970	3-50	2SC3104	3-169	MD007L	5-38
2SC1971	3-53	2SC3105	3-172		
2SC1972	3-56	2SC3133	3-174		
2SC2053	3-59	2SC3240	3-177		
2SC2055	3-62	2SC3241	3-180		

KINDS OF FUNCTION MAP



FREQUENCY f (MHz)



SELECTION GUIDE BY FUNCTION

Type No.	Applications					Features														Max. Rating		PKG Outline																												
	Frequency Band	Function	Set Power (W)	Use		f	Po	Gp	η	P _{in}	V _{cc}	V _{ab}	ρ	Z _{fo}	3fo	V _{cc}	Po																																	
				M	P	MHz	W	dB	%	mW	V	V	—	dBc	dBc	V	W																																	
M67755L *4 M67755H *4	VHF 140 MHz	FM	5		O	135~150 150~175	7	35.4	40	2	7.2	5	2.5	-25	-30	9	10	H12																																
M67748L/LR *5 M67748H/HR *5 M67748UH *5						FM	5		O	135~150 150~175 220~225	7	25.4	40	20	12.5	5	2.5	-20	-25	15	9	H27																												
M67798L **		FM	5		O					144~148	7	25.4	50	20	9.6	3.5	3	-25	-30	16	10	* 1																												
M67704 *6		FM	10	O		142~175	13	28.1	40	20	12.5	5	2.5	-20	-30	16	20	H16																																
M67741L *7 M67741H *7		FM	25	O		135~150 150~175	30	21.7	40	200	12.5	—	3.3	-25	-30	17	35	H2																																
M67781L M67781H						FM	35	O		135~160 150~175	40	21.2	40	300	12.5	—	3	-30	-30	16	50	H2																												
M68702L ** M68702LR ** M68702H **		FM	50	O		135~160 135~160 150~160	60	23.0	40	300	12.5	—	3	-30	-30	17	70	H2																																
M67799M **						FM	5		O	430~450	7	25.4	45	20	9.6	3.5	3	-25	-30	16	10	* 1																												
M67749GL ** M67749EL ** M67749SLR M67749SL ** M67749ULR M67749LRI ** M67749L/LR M67749M/MR M67749H/HR M67749UH**/UHR M67749SH/SHR**		UHF 400 MHz	FM	5		O	326~346 335~360 335~360 350~370 360~390 390~420 400~430 430~450 440~470 470~490 490~512	7	25.4	35	20	12.5	5	2.5	-20	-25	15	10	H27																															
M67729L2							FM													15	O		400~420	20	21.2	35	150	12.5	—	2.8	-30	-30	16	30	H18															
M57786L M57786H M57786UH M57786SH	FM						35													O		400~430 450~470 470~490 490~512	40	21.2	40	300	12.5	—	3.5	-30	-30	17	50	H3																
M68703M **																						FM													50	O		430~450	60	23.0	40	300	12.5	—	3	-30	-30	17	70	H3

Note: ** Under development, M: for MOBILE, P: for PORTABLE. PKG outline: see references "Package outline".

Specifications are shown in minimum values. Please refer to each spec. sheet for precise information.

*1: MOSFET 30×10mm

*2: 6pin type

*3: MCA Handy

*4: High gain type to M57785 series

*5: High gain, small package type to M57732, M57796 series

*6: High gain, small package type to M57719

*7: Wide band to M57741 series

SELECTION GUIDE BY FUNCTION

Type No.	Applications			Features						Max. Rating				PKG Outline
	Frequency Band	Func tion	Set Power (W)	f	Po	P _{in}	V _{oP}	η t	ρ_{in}	2fo	3fo	V _{cc}	P _o	
				MHz	W	mW	V	%	—	dBc	dBc	V	W	
M67729L2	400MHz	FM	15	400~420	20	150	12.5/12.5	35	2.8			16	30	H18
M67729H2				450~460	20	150	12.5/12.5	35	2	-30	-30	16	30	H18
M57734				453~458	25	300	12.5/12.5/12.5	40	2.5			17	35	H3
M57702	AMPS	FM	3	824~849	7	1	8/8/12.5	35	2.8	-30	-30	17	10	H11
M67754					6	1	8/8/12.5						10	H11
M57739C					6	30	12.5/12.5						12	H26
M67724		FM	0.6	824~849	1.6	1	7.2/7.2/7.2					9	3	H25
M67717	ETACS	FM	3	872~905	7	1	8/8/12.5	35	2.8	-30	-30	17	10	H11
M67759					6	1	8/8/12.5							
M57791	TACS	FM	3	890~915	7	1	8/8/12.5	35	2.8	-30	-30	17	10	H11
M57789	NMT900	FM	6	890~915	12	5	12.5/8/12.5	30	2.8	-30	-30	17	20	H3
M67769C					13	1	8/8/12.5						18	H3
M67747A	DDI	FM	3	898~925	7	1	8/8/12.5	35	2.8	-30	-30	17	10	H11
M67764	CRP	FM	4	940~960	8	2	8/12.5/12.5	35	2.8	-30	-30	17	10	H11
M67790					2	945~951	4	1	6/8/8	30	3	-30	-30	10
M67766A	D-AMPS	PSK	3	824~849	6	2	8/8/8/12.5	20	3	-30	-30	15.5	10	H3 *

Note. M: for MOBILE, P: for PORTABLE. PKG outline: see references "Package outline".

Specifications are shown in minimum values. Please refer to each spec. sheet for precise information.

* 8: 8pin type

SELECTION GUIDE BY FUNCTION

Type No.	Applications					Features												Max. Rating		PKG Outline
	Frequency Band	Func tion	Set Power (W)	Use		f	Po	Gp	η t	P in	Vcc	Vab	ρ in	2fo	3fo	Vcc	Po			
				M	P	MHz	W	dB	%	mW	V	V	-	dBc	dBc	V	W			
M57735	VHF6m	SSB	10	○		50~54	19	19.7	40	200	12.5	9	2.2	-25	-30	17	25	H3		
M67743L	VHF	FM	5	○		68~81	7	23.6	38	30	12.5	5	4	-18	-25	15	10	H13		
M67743H	MID					77~88														
M67742	BAND	FM	25	○		68~88	30	17.7	40	500	12.5	-	3	-25	-30	17	40	H2		
M57785L	VHF 140 MHz	FM	5	○		135~150	7	21.4	40	50	7.2	5	2.5	-20	-30	10	10	H12		
M57785M						150~162														
M57785H						162~174														
M67755L * 9						135~150	7	35.4	40	2	7.2	5	2.5	-25	-30	9	10	H12		
M67755H * 9						150~175														
M57783L			FM	5	○		135~160	7	21.4	45	50	7.5	5	2.5	-20	-30	9	10	H13	
M57783H			150~175																	
M67710L			FM	5	○		135~160	7	21.4	40	50	9.6	5	2.5	-20	-30	16	10	H13	
M67710H			150~175																	
M57796MA		FM	5	○		144~148	7	13.6	50	300	12.5	5	2.5	-20	-30	16	10	H14		
M57796L						135~150														
M57796H						150~175														
M57732L		FM	5	○		135~160	7	25.4	40	20	12.5	5	2.5	-20	-30	16	10	H12		
M57732		144~175																		
M67748L * 10		FM	5	○		135~150	7	25.4	40	20	12.5	5	2.5	-20	-25	15	9	H27 H27R H27 H27R		
M67748LR * 10						135~150														
M67748H * 10						150~175														
M67748HR * 10						150~175														
M57706L		FM	5	○		135~145	8	16.0	35	200	12.5	-	4	-15	-25	17	14	H2		
M57706		145~175																		
M57715		FM	10	○		144~148	13	18.1	48	200	12.5	-	2.8	-25	-30	17	20	H2 H2R H6		
M57715R																				
M57747																				
M57713 * 11		SSB	10	○		144~148	17	19.2	40	200	12.5	9	2.2	-25	-30	17	26	H3		
M67704 * 12		FM	10	○		142~175	13	28.1	40	20	12.5	5	2.5	-20	-30	16	20	H16		
M57719L		FM	10	○		135~145	14	18.4	40	200	12.5	-	4	-25	-35	17	20	H2		
M57719N						142~163														
M57719						145~175														
M57710-A * 13		FM	25	○		156~180	28	21.4	45	200	12.5	-	2.8	-25	-	17	40	H2		
M57737		FM	25	○		144~148	30	21.7	45	200	12.5	-	2.8	-25	-30	17	40	H2		
M57727 * 11		SSB	25	○		144~148	37	20.9	50	300	12.5	9	2.2	-25	-30	17	40	H3		

Note. M: for MOBILE, P: for PORTABLE. PKG outline: see references "Package outline".

Specifications are shown in minimum values. Please refer to each spec. sheet for precise information.

* 9: High gain type to M57785 series

* 10: High gain, small package type to M57732, M57796 series

* 11: All mode type

* 12: High gain, small package type to M57719 series

* 13: For Marine Radio

SELECTION GUIDE BY FUNCTION

Type No.	Applications					Features													Max. Rating		PKG Outline
	Frequency Band	Function	Set Power (W)	Use		f	P _o	G _p	η	P _{in}	V _{cc}	V _{BB}	ρ	2f _o	3f _o	V _{cc}	P _o				
				M	P	MHz	W	dB	%	mW	V	V	-	dBc	dBc	V	W				
M57741UL M57741L M57741M M57741H	VHF 140 MHz	FM	25	O		135~148 146~160 156~168 164~175		21.4 21.4 20.4 19.7		200 200 250 300	12.5	-	3.3	-25	-30	17	35	H2			
M67741L * 14 M67741H * 14					FM			135~150 150~175	30	21.7	40	200	12.5	-	3.3	-25	-30	17	35	H2	
M67781L M67781H		FM	35	O		135~160 150~175	40	21.2 21.2	40	300	12.5	-	3	-30	-30	17	50	H2			
M57726 M57726R		FM	35	O		144~148	43	20.3	50	400	12.5	-	2.8	-35	-45	17	55	H2 H2R			
M67727 * 15		SSB	45	O		144~148	60	20.7	50	500	12.5	9	2.8	-30	-35	16	78	H17			
M67702		FM	50	O		150~175	60	10.7	40	5000	12.5	-	2.8	-30	-35	17	90	H17			
M67785 M67785H		VHF BAND III	FM	3		O	186~200 220~240	5	24.0	40	20	9.6	5	2.5	-25	-30	13	6	H12		
M67713 M67723			FM	5		O	220~225	7	12.4 25.4	45	500 20	12.5	5	2.5	-20	-30	16	10	H14 H13		
M67730L	FM		25	O		175~200	30	20.0	43	300	12.5	-	2.8	-30	-35	17	40	H2			
M57774 M67712 * 15	FM SSB		25	O		220~225	30	20.0	43	300	12.5	- 9	2.8	-30	-35	17	40	H2 H3			
M57786UL M57786L M57786M M57786H	UHF 400 MHz		FM				360~380 400~430 430~470 470~512	6 7 7 7	20.7 21.4 21.4 21.4	38 40 40 40		50	7.2	5	2.5	-25	-30	10	10	H12	
M57799L1 M57799L2 M57799L M57799M M57799H		FM					5	O	335~360 360~400 400~430 430~470 470~512		21.7 21.7 21.7 21.7 21.7	35 35 40 40 40					3 3 2.5 2.5		-25	-30	9
M67705UL M67705L M67705M M67705H			FM						380~400 400~430 430~470 470~512				7	25.4	40	20	9.6	5	2.5	-25	-30

Note. M: for MOBILE, P: for PORTABLE. PKG outline: see references "Package outline".

Specifications are shown in minimum values. Please refer to each spec. sheet for precise information.

* 14: High power, wide band type to M57741 series

* 15: All mode type

SELECTION GUIDE BY FUNCTION

Type No.	Applications				Features													Max. Rating		PKG Outline	
	Frequency Band	Function	Set Power (W)	Use		f	Po	Gp	η	P _{in}	V _{cc}	V _{BB}	ρ_{in}	2fo	3fo	V _{cc}	Po				
				M	P	MHz	W	dB	%	mW	V	V	-	dBc	dBc	V	W				
M57797MA M57797SL M57797UL M57797L M57797H M57797UH M57797SH	UHF 400 MHz	FM	5	○	430~450	18.4			100			2.5						H14			
350~380					15.4			200			4.4										
380~400					15.4			200			2.5										
400~430					7	15.4	40	200	12.5	5	2.5	-25	-30	16	10						
450~470						15.4		200			2.5										
470~490						15.4		200			2.5										
490~512						15.4		200			2.5										
M57721L M57721M M57721		FM			350~400																H12
400~450					7	28.4	40	10	12.5	5	2.5	-30	-35	16	10						
450~512																					
M67749SLR *16 M67749ULR *16 M67749L *16 M67749LR *16 M67749M *16 M67749MR *16 M67749H *16 M67749HR *16 M67749UHR *16 M67749SHR *16★★		FM					335~360													H27	
360~380																					
400~430																					
400~430																					
430~450					7	25.4	35	20	12.5	5	2.5	-25	-30	15	10						
430~450																					
450~470																					
450~470																					
470~490																					
490~512																					
M57714EL M57714SL M57714UL M57714L M57714M M57714 M57714UH M57714SH		FM	5	○	335~360													H3			
360~380																					
380~400																					
400~420					7	18.4	38	100	12.5	-	2	-30	-30	17	12						
430~450																					
450~470																					
470~490																					
470~490																					
490~512																					
M67709L *17 M67709M *17 M67709H *17 M67709SH *17						FM	10	○	350~390												
390~430	13	31.1	35	10					12.5	5	2.8	-30	-30	16	20						
430~470																					
470~512																					

Note: ★★ Under development, M: for MOBILE, P: for PORTABLE, PKG outline: see references "Package outline".

Specifications are shown in minimum values. Please refer to each spec. sheet for precise information.

* 16: High gain, small package type to M57721, M57797 series

* 17: High gain, small package type to M57704 series

SELECTION GUIDE BY FUNCTION

Type No.	Applications					Features												Max. Rating		PKG Outline											
	Frequency Band	Function	Set Power (W)	Use		f	Po	Gp	η	P _{in}	V _{cc}	V _{as}	ρ_{in}	2fo	3fo	V _{cc}	Po														
				M	P	MHz	W	dB	%	mW	V	V	-	dBc	dBc	V	W														
M57704EL M57704SL M57704UL M57704L M57704M M57752 * 18 M57704MR * 20 M57704H M57704UH M57704SH	UHF 400 MHz	FM	10	O		335~360 360~380 380~400 400~420 430~450 430~450 450~470 470~490 490~512	13	18.1	35 35 35 35 35 40 35 35 35	200	12.5	-	2.8	-30	-30	17	20	H3													
M57716 * 19	SSB				10	O													430~450	17	19.2	35	200	12.5	9	2.5	-30	-30	17	128	H3
M67729L2 M67729H2	FM				15	O													400~420 450~460	20	21.2	35	150	12.5	-	2.8 2	-30	-30	16	30	H18
M57734	FM				15	O													453~458	25	19.2	40	300	12.5	-	2.5	-30	-30	17	35	H3
M57729EL M57729SL M57729UL M57729L M57729 M57729H M57729UH M57729SH	FM				25	O													335~360 360~380 380~400 400~420 430~450 450~470 470~490 490~512	30	20.0	40	300	12.5	-	2.8	-30	-30	17	40	H3
M57745 * 19	SSB				25	O													430~450	33	20.4	40	300	12.5	9	2.5	-30	-30	17	40	H3
M57788L M57788M M57788MR * 20 M57788H M57788UH M57788SH	FM				35	O													400~430 430~450 430~450 450~470 470~490 490~512	40 45 45 40 40 40	21.2 20.5 20.5 21.2 21.2 21.2	40 40 40 40 40 40	300 400 400 300 300 300	12.5 13.5 13.5 12.5 12.5 12.5	3.5 2.8 2.8 3.5 3.5 3.5	-	-30	-30	17	50	H3
M67703H M67703UH M67703SH	FM				45	O													450~470 470~490 490~512	50	7.0	40	10W	12.5	-	2.8	-30	-35	17	80	H17
M67728	SSB				45	O													430~450	60	7.7	40	10W	12.5	9	2.8	-30	-35	16	78	H17

Note: M: for MOBILE, P: for PORTABLE. PKG outline: see references "Package outline".

Specifications are shown in minimum values. Please refer to each spec. sheet for precise information.

* 18: High efficiency type

* 19: All mode type

* 20: Reverse pin type

SELECTION GUIDE BY FUNCTION

Type No.	Applications					Features													Max. Rating		PKG Outline
	Frequency Band	Func tion	Set Power (W)	Use		f	Po	Gp	η t	P _{in}	V _{cc}	V _{be}	ρ in	2fo	3fo	V _{cc}	Po				
				M	P	MHz	W	dB	%	mW	V	V	-	dBc	dBc	V	W				
M57775	UHF 800 MHz	FM	Exiter Use	○		806~866	0.2	23.0	*21	1 1.5	8	-	3.0 2.8	-30	-30	15	0.8 0.6	H8			
M57776						890~915	0.3														
M67706		FM	2		○		806~870	4	16.0	30	100	7.5	-	4	-30	-30	10 9	5	H13		
M67706U							896~941														
M67776L		FM	3		○		806~870	5	37.0	30	1	7.2	-	3	-30	-30	9.2	8	H11		
M67776H							896~941														
M57755		FM	8	○			806~866	10	20.0	35	100	12.6	-	2.8	-30	-30	17	16	H3		
M67736		FM	10	○			896~941	12	33.8	30	5	12.5	8	2.8	-30	-30	17	20	H3		
M57764		FM	15	○			806~825	20	16.9	30	400	12.5	-	2.8	-30	-30	17	25	H3		
M57792		FM	15	○			806~870	20	16.9	30	400	13.5	-	2.8	-30	-30	17	30	H3		
M57749 * 22		FM	5	○			903~905	7	15.4	30	200	12.5	-	2.5	-30	-30	17	10	H3		
M57793 * 22		FM	5	○			903~905	7	38.5	35	1	12.5	-	2.5	-30	-30	17	10	H11		
M67745		FM	5	○			846~903	7	35.4	35	2	12.5	-	2.8	-30	-30	17	10	H11		
M67761		FM	5	○			893~901	7	38.5	35	1	7.2	-	2.5	-30	-30	9.2	9	H11		
M67784		FM	3		○		889~915	3.8	35.7	35	1	9.6	-	2.8	-30	-30	12	6	H25		
M57744		FM	10	○			889~915	13	16.3	30	300	12.5	-	2.5	-25	-30	17	18	H3		
M67783 * 23	UHF 1.2 GHz	FM	1		○	1240~1300	1.4	23.0	20	7	7.2	-	3.5	-28	-	15	2.5	H27			
M67715 * 24		SSB	1		○	1240~1300	1.2	20.7	18	10	8	8	2.5	-30	-35	16	4	H13			
M67732 * 25		FM	1		○	1240~1300	1	21.5	25	7	7.2	-	2.5	-30	-	16	2	H13			
M67711		FM	10	○			1240~1300	16	12.0	30	1000	12.5	9	2.0	-45	-	17	20	H3		
M57762		SSB	10	○			1240~1300	18	12.5	30	1000	12.5	9	2.0	-45	-	17	20	H3		
M67775	UHF 1.4 GHz	FM	5	○		1465~1477	7.5	35.7	30	2	13.5	8	2.8	-25	-30	16	10	H3			

Note. M: for MOBILE, P: for PORTABLE. PKG outline: see references "Package outline".

Specifications are shown in minimum values. Please refer to each spec. sheet for precise information.

* 21: $I_t \leq 230\text{mA}$ @ $P_o = 0.2\text{W}$

* 22: Personal radio

* 23: Small package type

* 24: Driver stage for M57762

* 25: Driver stage for M67711

SELECTION GUIDE BY FUNCTION

FOR CITIZEN'S BAND TRANSCEIVER, 27MHz 12V SERIES ($T_c = 25^\circ\text{C}$)

Type No.	Application	Structure	Maximum Ratings						I _{CSO} (max) (μA)	P _o (min)				η_c (min) (%)	Package outline
			V _{CSO} (V)	V _{ESD} (V)	I _c (A)	P _c (W)	T _J ($^\circ\text{C}$)	R _{thc} ($^\circ\text{C}/\text{W}$)		V _{CC} (V)	f (MHz)	P _{in} (W)	(W)		
2SC2086	HPA	Si, NPN, EP	75	4	1	0.8 *1	+135	137.5 *2	100	12	27	0.015	0.3	50	T-1B
2SC2166	HPA	Si, NPN, EP	75	5	4	12.5	+150	10	100	12	27	0.25	6	55	T-30
2SC1944	HPA	Si, NPN, EP	80	5	6	20	+150	6.25	100	12	27	1	13	55	T-30
2SC1945	HPA	Si, NPN, EP	80	5	6	20	+150	6.25	100	12	27	0.5	14	60	T-30E
2SC1969	HPA	Si, NPN, EP	60	5	6	20	+150	6.25	100	12	27	1	16	60	T-30
2SC3133	HPA	Si, NPN, EP	60	5	6	20	+150	6.25	100	12	27	0.5	13	60	T-30E

* 1: $T_a = 25^\circ\text{C}$, * 2: R_{thc}FOR MOBILE RADIOS, 13.5V SERIES ($T_c = 25^\circ\text{C}$)

2SC2097	HPA	Si, NPN, EP	50	5	15	150	+175	1.2	5000	13.5	30	4	75	55	T-40E
2SC3241	HPA	Si, NPN, EP	50	5	18	180	+175	0.83	5000	12.5	30	4	75	55	T-45E
2SC2904	HPA	Si, NPN, EP	50	5	22	200	+175	0.75	5000	12.5	30	7	100	55	T-40E
2SC3908	HPA	Si, NPN, EP	50	5	22	200	+175	0.75	5000	12.5	30	7	100	55	T-40E
2SC3240	HPA	Si, NPN, EP	50	5	25	270	+175	0.556	5000	12.5	30	7	100	55	T-45E

28V SERIES TO FIXED STATION APPLICATIONS ($T_c = 25^\circ\text{C}$)

2SC2133 *	HPA	Si, NPN, EP	55	4	5	75	+175	2.0	2000	28	220	4.5	30	55	T-40E
2SC2134 *	HPA	Si, NPN, EP	55	4	10	120	+175	1.25	5000	28	220	12	60	55	T-40E
2SC2609 *	HPA	Si, NPN, EP	55	4	15	170	+175	0.88	10000	28	220	25	100	55	T-40E

*: Communication grade

150/400MHz BAND 7.2V SERIES FOR MOBILE RADIOS ($T_c = 25^\circ\text{C}$)

2SC2055	HPA	Si, NPN, EP	18	4	0.3	0.5 *1	+135	220 *2	30	7.2	175	0.01	0.2	50	T-1B
2SC3404	HPA	Si, NPN, EP	20	3.5	1	5	+175	30	200	7.2	175	0.08	1.5	55	T-46
2SC3017	HPA	Si, NPN, EP	20	3.5	1	4	+175	37.5	200	7.2	175	0.1	1.5	55	T-8E
2SC2056	HPA	Si, NPN, EP	18	4	0.6	4	+175	37.5	100	7.2	175	0.2	1.6	55	T-8E
2SC3018	HPA	Si, NPN, EP	20	3.5	1.5	10	+175	15	300	7.2	175	0.15	3	55	T-31E
2SC3001	HPA	Si, NPN, EP	20	3.5	3	20	+175	7.5	500	7.2	175	0.3	6	60	T-31E
2SC4240	HPA	Si, NPN, EP	20	3.5	3	20	+175	7.5	500	7.2	175	0.3	6	60	T-46
2SC3629	HPA	Si, NPN, EP	20	3.5	1	5	+175	30	200	7.2	520	0.2	1.2	55	T-46
2SC3103	HPA	Si, NPN, EP	20	3.5	1.5	10	+175	15	300	7.2	520	0.6	2.8	55	T-31E
2SC3379	HPA	Si, NPN, EP	20	3.5	1.5	10	+175	15	300	7.2	520	0.6	2.8	55	T-46
2SC3104	HPA	Si, NPN, EP	20	3.5	3	20	+175	7.5	500	7.2	520	2	6	60	T-31E

* 1: $T_a = 25^\circ\text{C}$, * 2: R_{thc}UHF BANDWIDTH RANGE 24V SERIES FOR LINEAR AMPLIFIER ($T_c = 25^\circ\text{C}$)

2SC2797 *	HPA	Si, NPN, EP	45	4	1	10	+175	15	400	24	770	1	5	55	T-41
2SC2798 *	HPA	Si, NPN, EP	45	4	2	30	+175	5	1000	24	770	3	12	55	T-41
2SC2799 *	HPA	Si, NPN, EP	45	4	4	50	+175	3	1500	24	770	8	25	55	T-41E

*: Communication grade

SELECTION GUIDE BY FUNCTION

150MHz BAND 13.5V SERIES FOR MOBILE RADIOS ($T_c = 25^\circ\text{C}$)

Type No.	Structure	Application	Maximum Ratings						Icbo (max) (μA)	Po (min)				η_c (min) (%)	Package outline
			Vcbo (V)	Vebo (V)	Ic (A)	Pc (W)	Tj ($^\circ\text{C}$)	Rth-c ($^\circ\text{C}/\text{W}$)		Vcc (V)	f (MHz)	Pin (W)	(W)		
2SC2053	HPA	Si, NPN, EP	40	4	0.3	0.6 *1	+135	183 *2	20	13.5	175	0.004	0.15	40	T-1B
2SC741 *3	HPA	Si, NPN, EP	40	4	0.3	2.5	+175	60	1	13.5	150	0.01	0.2	50	T-8C
2SC2538	HPA	Si, NPN, EP	40	4	0.4	3	+135	36.7	100	13.5	175	0.05	0.5	45	T-1B
2SC730 *3	HPA	Si, NPN, EP	40	4	0.4	3	+175	50	10	13.5	150	0.1	1	50	T-8
2SC1970	HPA	Si, NPN, EP	40	4	0.6	5	+150	25	100	13.5	175	0.12	1	50	T-30
2SC1947 *4	HPA	Si, NPN, EP	35	4	1	10	+175	15	500	13.5	175	0.3	3.5	50	T-8E
2SC2627	HPA	Si, NPN, EP	35	4	2	20	+175	7.5	1000	12.5	175	0.25	5	60	T-41
2SC2237	HPA	Si, NPN, EP	35	4	2	20	+175	7.5	500	13.5	175	0.25	6	60	T-31E
2SC3628	HPA	Si, NPN, EP	35	4	2	20	+175	7.5	500	13.5	175	0.25	6	60	T-46
2SC1971	HPA	Si, NPN, EP	35	4	2	12.5	+175	10	500	13.5	175	0.6	6	60	T-30E
2SC1985 *4	HPA	Si, NPN, EP	35	4	1	15	+175	10	500	13.5	175	0.6	6	50	TC-17
2SC2539	HPA	Si, NPN, EP	35	4	4	35	+175	4.3	1000	13.5	175	0.5	14	60	T-31E
2SC1729	HPA	Si, NPN, EP	35	4	3.5	35	+175	4.3	1000	13.5	175	1.4	14	60	T-31E
2SC1972	HPA	Si, NPN, EP	35	4	3.5	25	+175	6	1000	13.5	175	2.5	14	60	T-30E
2SC2628	HPA	Si, NPN, EP	35	4	4	40	+175	3.75	2000	12.5	175	1	15	60	T-41
2SC2094	HPA	Si, NPN, EP	40	4.5	3.5	30	+175	5	2000	13.5	175	2	15	60	T-31E
2SC1946	HPA	Si, NPN, EP	35	4	7	50	+175	3	2000	13.5	175	6	28	60	T-31E
2SC1946A	HPA	Si, NPN, EP	35	4	7	50	+175	3	2000	13.5	175	3	30	60	T-31E
2SC2629	HPA	Si, NPN, EP	35	4	8	60	+175	2.5	3000	13.5	175	3.5	30	60	T-41
2SC2540	HPA	Si, NPN, EP	35	4	10	75	+175	2	2500	13.5	175	6	40	60	T-40E
2SC2630	HPA	Si, NPN, EP	35	4	14	100	+175	1.5	5000	12.5	175	10	50	60	T-40E
2SC2694	HPA	Si, NPN, EP	35	4	20	140	+175	1.07	5000	12.5	175	15	70	60	T-40E
MTH326 ★★	HPA	Si, NPN, EP	35	4	25	185	+175	0.8	5000	12.5	175	15	80	60	T-40E

*1: $T_a = 25^\circ\text{C}$, *2: Rth-a

*3: High-reliability Communication grade

*4: Communication grade

★★: Under development

SELECTION GUIDE BY FUNCTION

400MHz BAND 13.5V SERIES FOR MOBILE RADIOS ($T_c = 25^\circ\text{C}$)

Type No.	Structure	Application	Maximum Ratings						I_{cbo} (max) (μA)	P_o (min)				η_c (min) (%)	Package outline
			V_{cbo} (V)	V_{ebo} (V)	I_c (A)	P_c (W)	T_j ($^\circ\text{C}$)	R_{th-c} ($^\circ\text{C}/\text{W}$)		V_{cc} (V)	f (MHz)	P_{in} (W)	(W)		
25C3019	HPA	Si, NPN, EP	35	4	0.4	0.9	+135	166	500	12.5	520	0.02	0.5	40	T-43
25C908 *1	HPA	Si, NPN, EP	40	4	0.5	4.3	+175	35	50	13.5	500	0.4	1	50	T-8
25C2131 *2	HPA	Si, NPN, EP	40	4	0.6	4	+175	37.5	100	13.5	500	0.3	1.4	50	T-8E
25C3101	HPA	Si, NPN, EP	35	4	1	10	+175	15	300	12.5	520	0.8	3	50	T-8E
25C3630	HPA	Si, NPN, EP	35	4	1	10	+175	15	300	12.5	520	0.8	3	50	T-46
25C1966	HPA	Si, NPN, EP	35	3.5	1	10	+175	15	100	13.5	470	0.5	3	50	T-31E
25C3020	HPA	Si, NPN, EP	35	4	1	10	+175	15	300	12.5	520	0.3	3	50	T-31E
25C1967	HPA	Si, NPN, EP	35	4	2	20	+175	7.5	200	13.5	470	1.5	7	50	T-31E
25C3021	HPA	Si, NPN, EP	35	4	2	20	+175	7.5	500	12.5	520	1.2	7	50	T-31E
25C4167	HPA	Si, NPN, EP	35	4	2	20	+175	7.5	500	12.5	520	1.2	7	50	T-46
25C1968	HPA	Si, NPN, EP	35	4	5	40	+175	3.75	500	13.5	470	6	14	50	T-31E
25C1968A	HPA	Si, NPN, EP	35	4	5	40	+175	3.75	500	13.5	470	4	14	50	T-31E
25C3022	HPA	Si, NPN, EP	35	4	7	50	+175	3	2000	12.5	520	6	18	55	T-31E
25C2695	HPA	Si, NPN, EP	35	4	10	75	+175	2	2000	13.5	520	9	28	55	T-31E
25C2905	HPA	Si, NPN, EP	35	4	15	120	+175	1.25	2000	12.5	520	15	45	60	T-40E
25C3102	HPA	Si, NPN, EP	35	4	18	170	+175	0.88	5000	12.5	520	20	60	60	T-40E
25C4989	HPA	Si, NPN, EP	35	4	20	150	+175	1.00	5000	12.5	520	20	70	60	T-40E

*1: High-reliability Communication grade

*2: Communication grade

900MHz BAND 12.5V SERIES ($T_c = 25^\circ\text{C}$)

25C2932 *1	HPA	Si, NPN, EP	35	3	2	20	+175	7.5	2000	12.5	900	1	6	55	T-31B
25C2933 *1	HPA	Si, NPN, EP	35	3	4	40	+175	3.75	2000	12.5	900	3	14	50	T-31B
25C3105 *1	HPA	Si, NPN, EP	35	3	10	80	+175	1.87	5000	12.5	850	15	30	50	T-44
25C3804 *1	HPA	Si, NPN, EP	35	3	12	100	+175	1.5	5000	13.5	850	20	40	50	T-44
25C4624 *2	HPA	Si, NPN, EP	35	2.5	15	110	+175	1.36	5000	12.5	900	15	45	45	T-44

*: Common Base *2: Common Emitter

L-BAND (1.65GHz) 28V ($T_c = 25^\circ\text{C}$)

25C4838	HPA	Si, NPN, EP	50	4	2	17.5	+175	8.6	1000	28	1650	0.7	6	45	T-31B
25C4524	HPA	Si, NPN, EP	50	4	2.5	30	+175	5	1000	28	1650	2	7	45	T-31B
25C4525	HPA	Si, NPN, EP	50	4	5	60	+175	2.5	2000	28	1650	5	20	40	X-139
25C4526	HPA	Si, NPN, EP	50	4	7.5	90	+175	1.7	3000	28	1650	10	28	40	X-139

*: Common Base

15V SERIES FOR CATV/MATV AMPLIFIER ($T_c = 25^\circ\text{C}$)

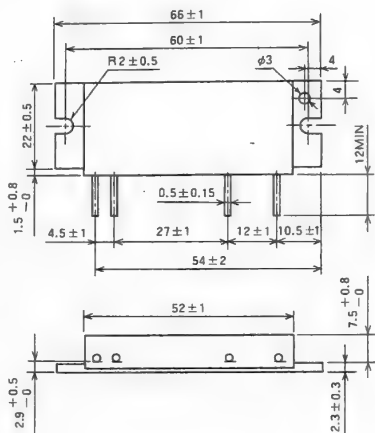
Type No.	Structure	Application	Maximum Ratings						I_{cbo} (max) (μA)	G_o (min)				η_c (min) (%)	Package outline
			V_{cbo} (V)	V_{ebo} (V)	I_c (A)	P_c (W)	T_j ($^\circ\text{C}$)	R_{th-c} ($^\circ\text{C}/\text{W}$)		V_{cc} (V)	f (MHz)	P_{in} (W)	(dB)		
25C1324 *1	HPA	Si, NPN, EP	35	4	0.15	3	+175	50	50	15	770	0.03	9	-	T-8

*1: High-reliability Communication grade

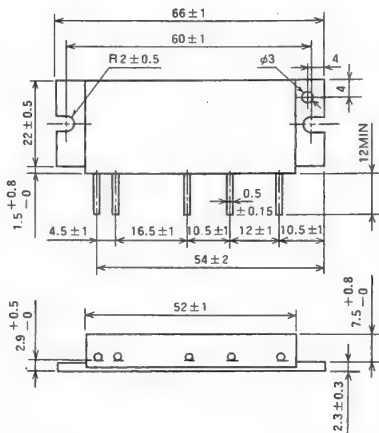
OUTLINE DRAWING

Dimensions in mm

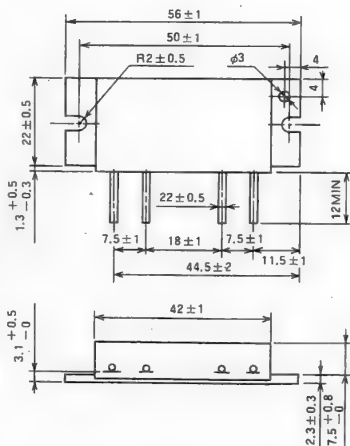
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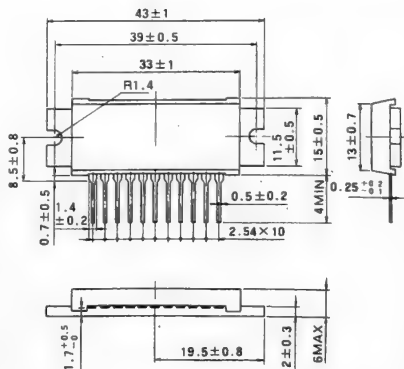
H3



H6



H8

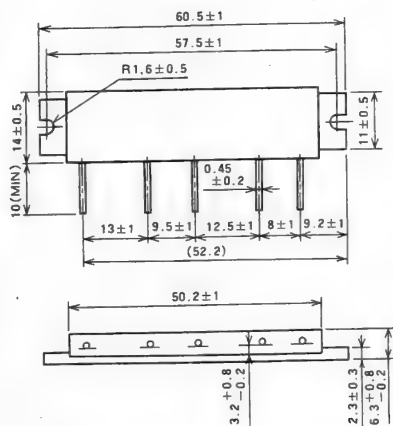


OUTLINE DRAWINGS

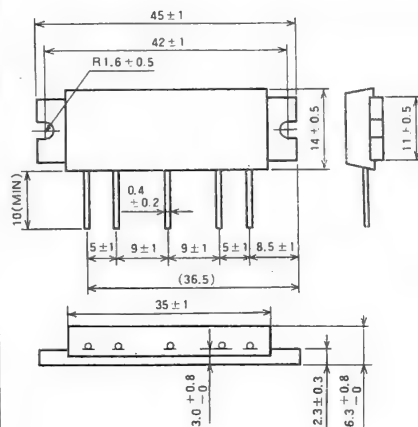
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Dimensions in mm

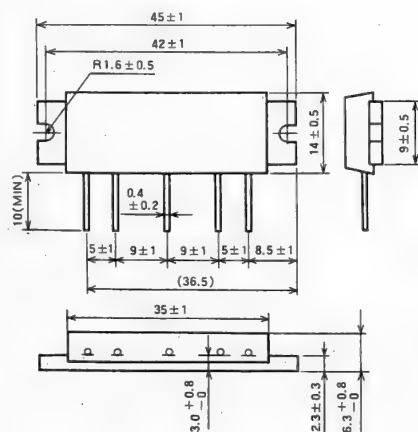
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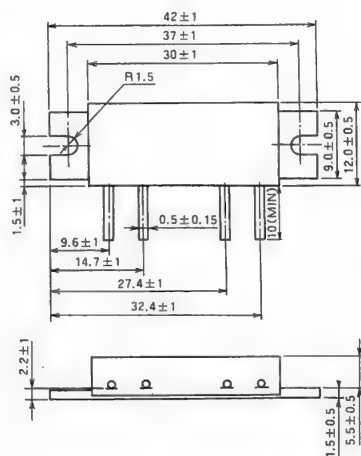
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H13

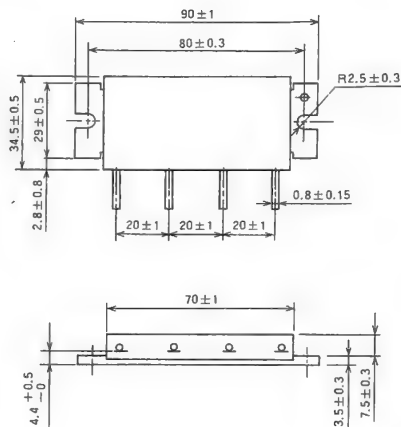


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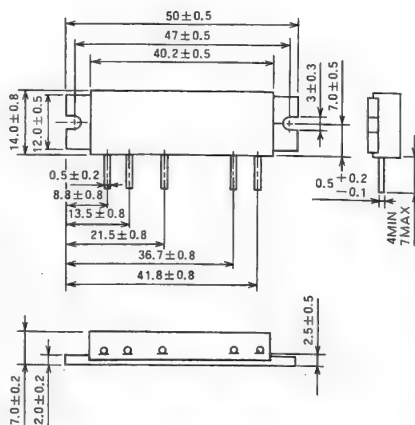


Dimensions in mm

H17



H25

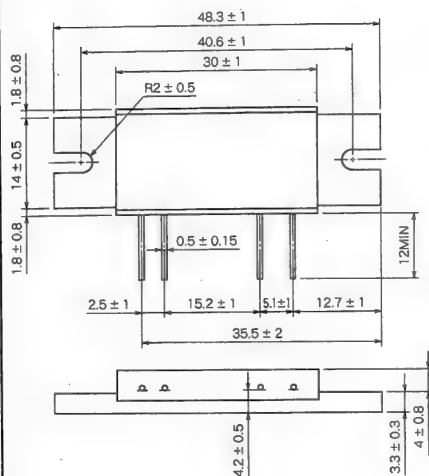


OUTLINE DRAWINGS

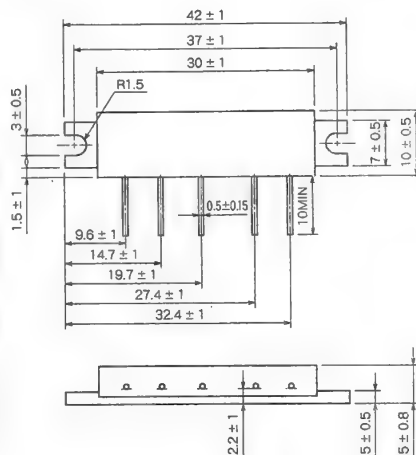
OUTLINE DRAWING

Dimensions in mm

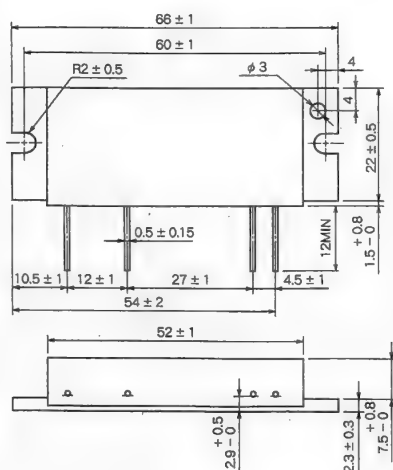
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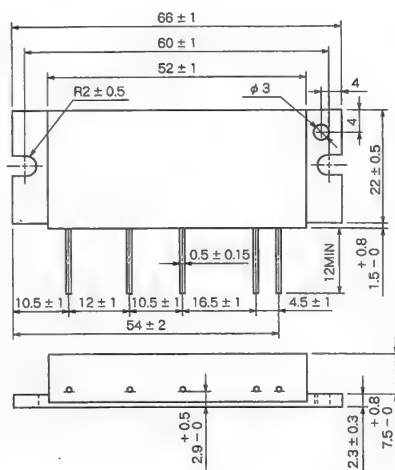
H27



H2R



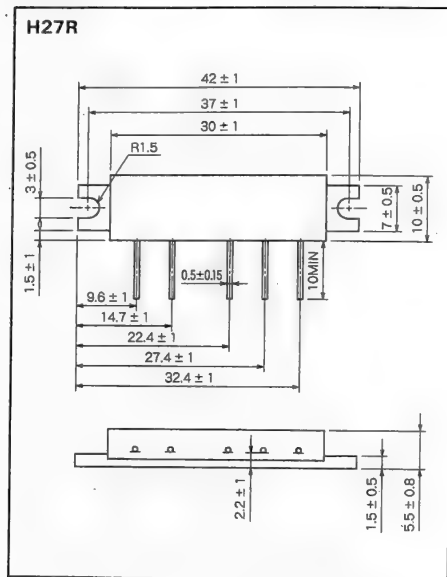
H3R



OUTLINE DRAWINGS

OUTLINE DRAWING

Dimensions in mm

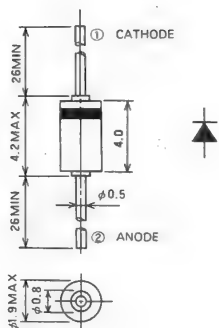


OUTLINE DRAWINGS

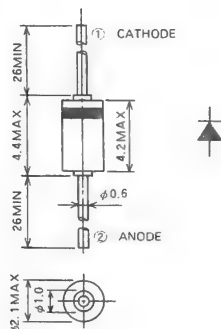
OUTLINE DRAWING

Dimensions in mm

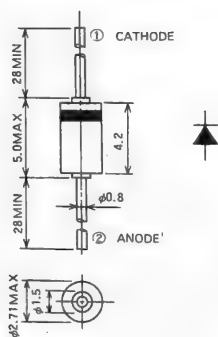
D-1



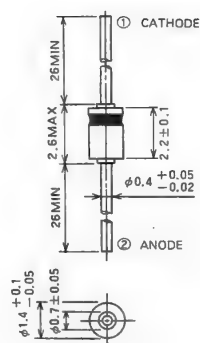
D-2



D-3



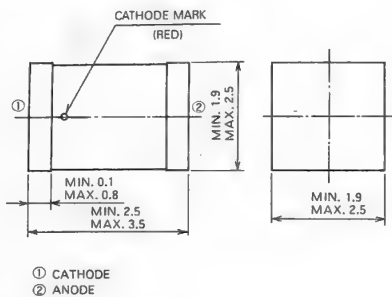
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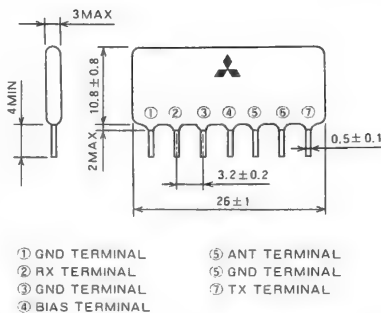
OUTLINE DRAWING

Dimensions in mm

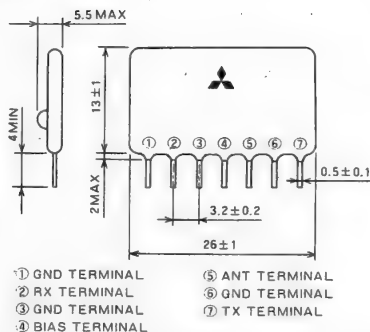
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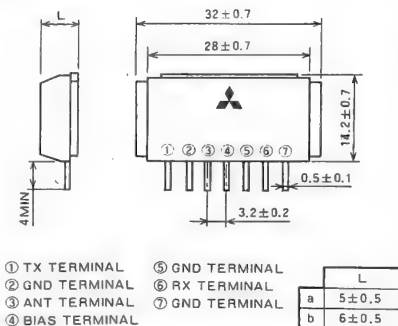
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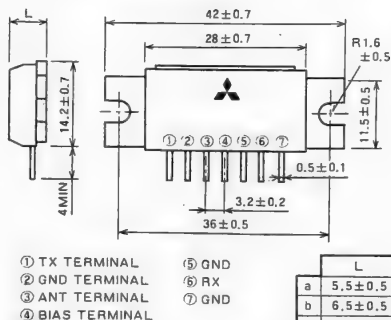
D-8



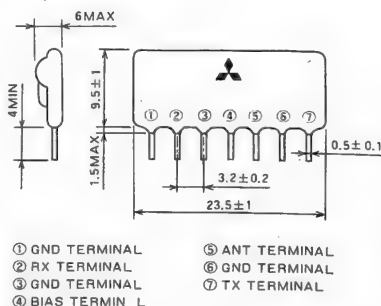
D-9



D-10



D-11

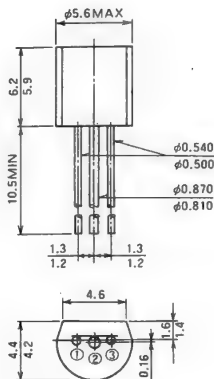


OUTLINE DRAWINGS

OUTLINE DRAWING

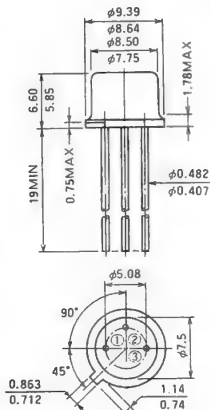
Dimensions in mm

T-1B



- ① EMITTER
② COLLECTOR
③ BASE

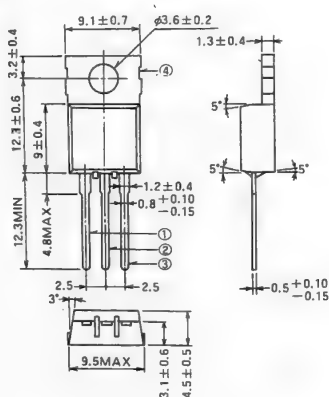
T-8



- ① EMITTER
② BASE
③ COLLECTOR JEDEC : TO-39

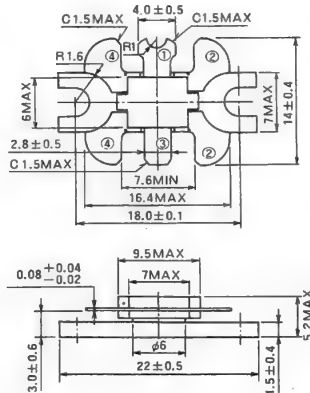
NOTE T-8C : COLLECTOR ELECTRODE IS CONNECTED WITH CASE
T-8E : EMITTER ELECTRODE IS CONNECTED WITH CASE.

T-30



- T-30
① BASE
② COLLECTOR (FIN)
③ EMITTER
④ FIN (COLLECTOR)
- T-30E
① BASE
② EMITTER (FIN)
③ COLLECTOR
④ FIN (EMITTER)

T-31



- T-31E :
① COLLECTOR
② EMITTER (FLANGE)
③ BASE
④ EMITTER (FLANGE)
- T-31B :
① COLLECTOR
② BASE (FLANGE)
③ EMITTER
④ BASE (FLANGE)

Dimensions in mm

[illegible]

- T-40E : EMITTER ELECTRODES ARE
CONNECTED WITH FLANGE.

1) COLLECTOR
2) EMITTER

- T-41E : EMITTER ELECTRODES ARE
CONNECTED WITH FLANGE

[illegible]

- ① COLLECTOR
② EMITTER
③ BASE
④ EMITTER

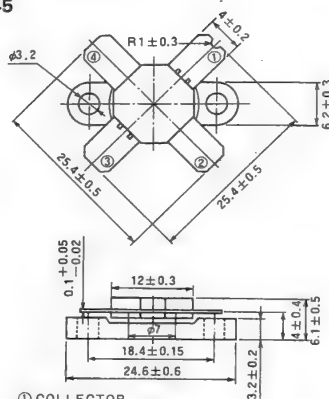
- ① COLLECTOR
② BASE (FLANGE)
③ EMITTER
④ BASE (FLANGE)

OUTLINE DRAWINGS

OUTLINE DRAWING

Dimensions in mm

T-45



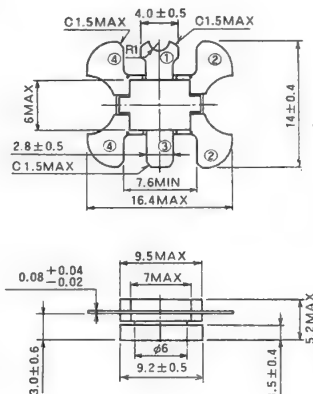
- ① COLLECTOR
- ② EMITTER
- ③ BASE
- ④ EMITTER

NOTE

T-45: ALL ELECTRODES ARE ISOLATED FROM FLANGE.

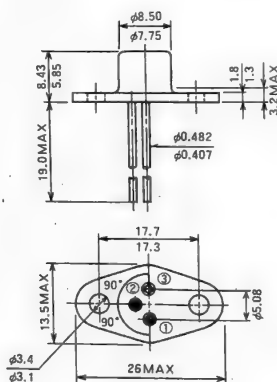
T-45E: EMITTER ELECTRODES ARE CONNECTED WITH FLANGE.

T-46



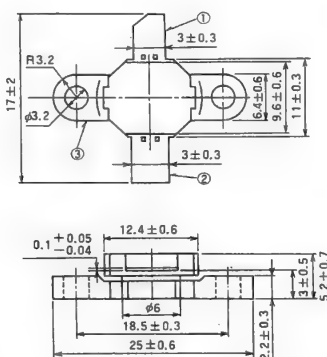
- ① COLLECTOR
- ② EMITTER (FLANGE)
- ③ BASE
- ④ EMITTER (FLANGE)

TC-17



- ① EMITTER (CASE)
- ② BASE
- ③ COLLECTOR

X-139



- ① COLLECTOR
- ② EMITTER
- ③ BASE (FLANGE)

PRECAUTIONS AND RECOMMENDATIONS

GENERAL

Mitsubishi RF Power Modules for mobile radio applications have high reliability and good performance, as they are designed and manufactured under strict quality control. However, the reliability of semiconductor devices is remarkably affected by usage conditions such as circuit constructions, mounting method, environments, etc.. In order to keep high reliability and obtain good performance when using Mitsubishi RF Power Modules, the following important points concerning maximum ratings, handling, etc., should be noted before use.

1. MAXIMUM RATINGS

Maximum ratings of the RF Power Modules are defined by the "Absolute Maximum Ratings" shown in separate specification sheet. Maximum ratings should not be exceeded in any circumstances, even momentarily. If a device is operated in excess of the absolute maximum ratings, the device may immediately be degraded or destroyed. Furthermore, in designing an electronic circuit using RF Power Modules, it is necessary to note that the maximum ratings of the devices should not be exceeded even if external conditions are changed.

2. NORMAL OPERATING VOLTAGE

Normal operating voltage is 12.5~13.8 volts for Mitsubishi RF Power Modules, because they are designed for mobile radio applications. The regulated 9 volts is recommended for the base biasing voltage of the modules for linear power amplifiers (for SSB).

3. THERMAL DESIGN

In order to keep high reliability of the equipment, it is better to keep the module temperature low. The case temperature of the module, when operated standard conditions, is lower than 90°C under all severe ambient temperature, recommend normally 60°C.

4. MOUNTING AND HANDLING

4-1 When the module is mounted on to a heat sink of a equipment, thermal compound to get good heat sinking should be applied between the module's fin and the heat sink. Following thermal compound for good heat sinking is recommended.

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4-2 When mounting a module to the circuit, do not apply excessive stress to the terminal leads or the fin. In particular, if there are some foreign objects between the module and the heat sink, or if there are some burrs or rising on the surface of the heat sink, it may happen that the substrate of the module will crack or break due to excessive stress from screwing the module on to the heat sink. Therefore, the surface of the heat sink in contact with the module must be as flat as possible.

When screwing a module to the heat sink, torque screw is recommended as 5 to 6kg-cm when using

φ3mm screws.

4-3 For soldering, the major precautions are as follows:

1) Flux;

Roles of flux are to remove oxidized layer on the object, and prevent from oxidation during heating or lowering surface tension on the objects. Rosin flux, which is less corrosional and highly insulative, is recommended.

2) Soldering temperature;

The temperature of the lead soldering should be lower than 260°C and shorter than 10 seconds, or lower than 350°C and shorter than 3 seconds.

3) Cleaning after soldering;

The recommended solvent for cleaning the residual flux is the Ethyl Alcohol. Trichlene type solvents should not be used.

4-4 When the module is screwed after soldering the terminal leads to the circuit board, excessive stress is applied to the leads. Therefore, please solder the terminal leads to the circuit board after screwing the module to the heat sink.

4-5 If the module falls onto a hard surface, it will be damaged by mechanical shock and can no longer be used.

4-6 To obtain good stability and electrical performances, it is necessary to take precautions concerning the earth potential of the module. As the fin is the ground terminal, the fin should be connected to the ground of the set completely in RF condition.

4-7 The values of input VSWR and output VSWR of the module indicated in the specification sheet are guaranteed when the input and output leads are straight and these leads are connected to the load 50 Ω within 10mm length. If the device is mounted under different conditions from these mentioned above, the performances, such as output power and efficiency, may be degraded due to the impedance mismatch. In order to reform such an impedance mismatch, please set the additional matching circuits to get good impedance matching.

5. VOLTAGE SUPPLY

The modules have 2 or 3 terminals for DC power supply. If these terminals are combined without RFC (Radio Frequency Choke), or if each terminal is not bypassed with the condenser, parasitic oscillation occasionally may occur. Therefore, the DC Power Supply Terminals should be combined with RFC, and each terminal bypassed with the condensers (10 μF and 4700 pF in Parallel).

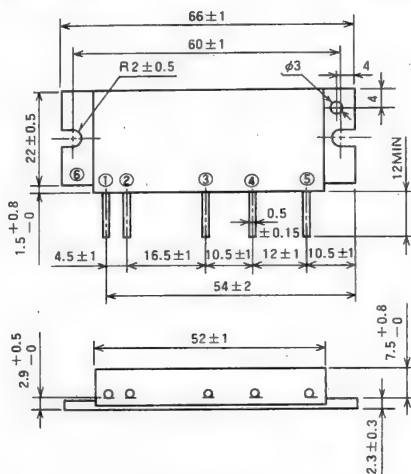
The first stage transistor of the module even for FM is operated in class AB. When excessively high voltage is applied to the first stage DC Power Supply Terminal, the first stage transistor may be destroyed due to current runaway. Therefore, the first stage supply voltage must be controlled, not exceeding 17 volts DC.

RF POWER MODULES

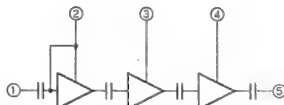
2

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

①Pin : RF INPUT

②Vcc1 : 1st. DC SUPPLY

③Vcc2 : 2nd. DC SUPPLY

④Vcc3 : 3rd. DC SUPPLY

⑤Po : RF OUTPUT

⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

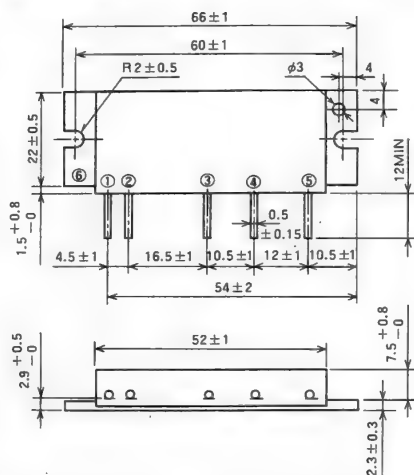
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.2W V _{cc} = 12.5V Z _G = Z _L = 50 Ω	335	360	MHz
P _o	Output power		13		W
η _T	Total efficiency		35		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 14W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

M57704SL

360~380MHz, 12.5V, 13W, FM MOBILE RADIO

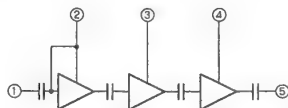
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

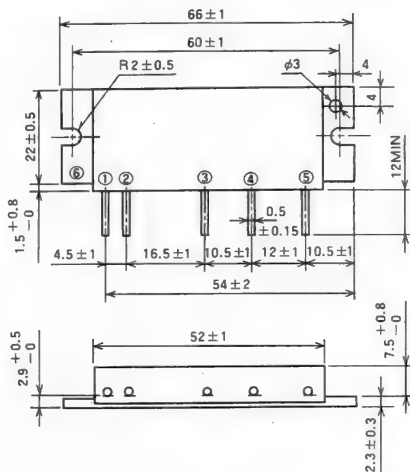
Symbol	Parameter	Test conditions	Limits	Unit
f	Frequency range	P _{in} = 0.2W V _{cc} = 12.5V Z _G = Z _L = 50 Ω	Min	Max
P _o	Output power		360	380
η _T	Total efficiency		13	
2f _o	2nd. harmonic		35	
ρ _{in}	Input VSWR			
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 14W (P _{in} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation	

M57704UL

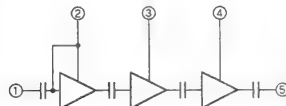
380-400MHz, 12.5V, 13W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

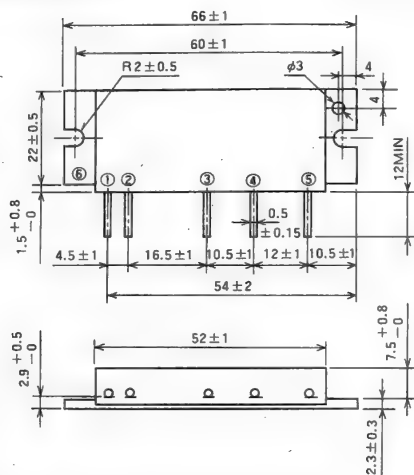
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		5	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	20	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{sta}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		380	400	MHz
P _o	Output power	P _{in} = 0.2W	13		W
η _T	Total efficiency	Vcc = 12.5V	35		%
2f _o	2nd. harmonic	Z ₀ = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V, P _o = 14W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

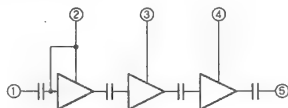
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vcc2 : 2nd. DC SUPPLY
④Vcc3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{STG}	Storage temperature		-40~110	°C

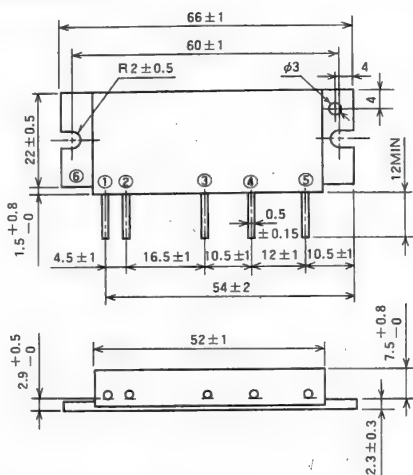
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.2W$ $V_{CC} = 12.5V$ $Z_G = Z_L = 50 \Omega$	400	420	MHz
Po	Output power		13		W
η_T	Total efficiency		35		%
2fo	2nd. harmonic			-30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{CC} = 15.2V$, $P_o = 14W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

M57704M

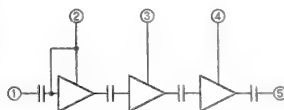
430~450MHz, 12.5V, 13W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM

PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

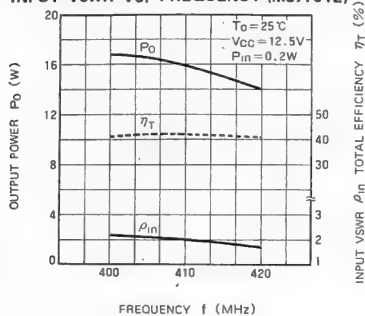
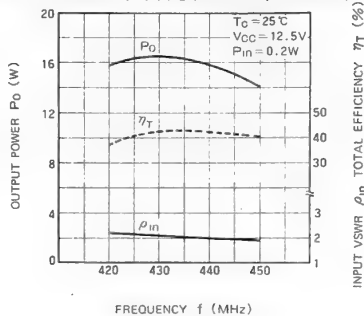
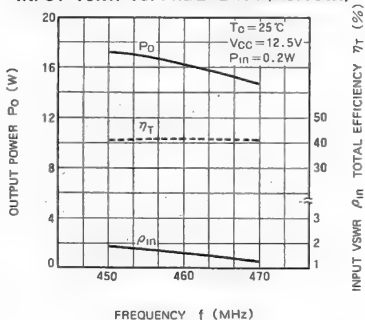
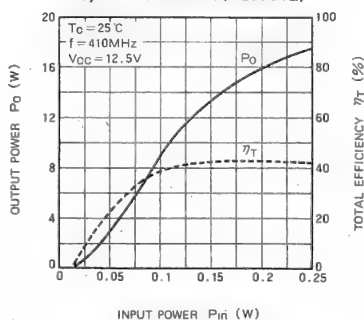
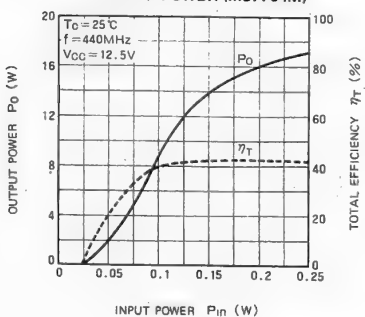
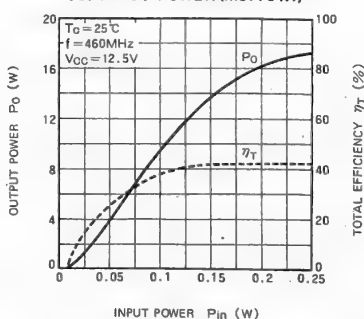
ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		5	A
P _{in(max)}	Input power	Z _g = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z _g = Z _L = 50 Ω	20	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

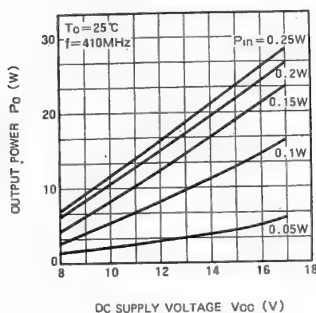
ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.2W Vcc = 12.5V Z _g = Z _L = 50 Ω	430	450	MHz
P _o	Output power		13		W
η _T	Total efficiency		35		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V, P _o = 14W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _g = 50 Ω	No degradation		-

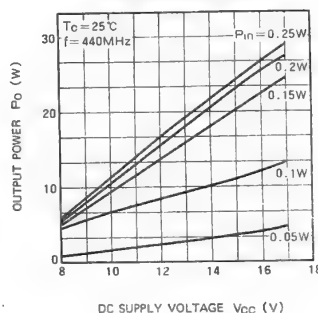
TYPICAL PERFORMANCE DATA

OUTPUT POWER TOTAL EFFICIENCY
INPUT VSWR VS. FREQUENCY (M57704L)OUTPUT POWER TOTAL EFFICIENCY
INPUT VSWR VS. FREQUENCY (M57704M)OUTPUT POWER TOTAL EFFICIENCY
INPUT VSWR VS. FREQUENCY (M57704H)OUTPUT POWER TOTAL EFFICIENCY
VS. INPUT POWER (M57704L)OUTPUT POWER TOTAL EFFICIENCY
VS. INPUT POWER (M57704M)OUTPUT POWER TOTAL EFFICIENCY
VS. INPUT POWER (M57704H)

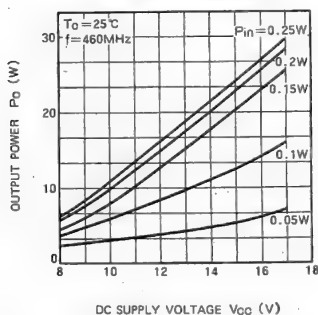
OUTPUT POWER VS. DC SUPPLY VOLTAGE (M57704L)



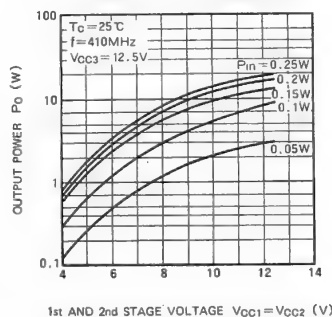
OUTPUT POWER VS. DC SUPPLY VOLTAGE (M57704M)



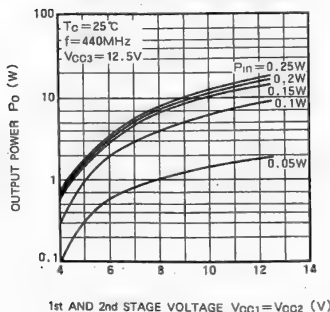
OUTPUT POWER VS. DC SUPPLY VOLTAGE (M57704H)



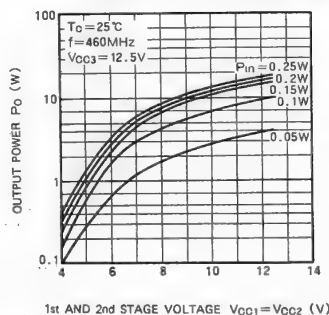
OUTPUT POWER VS. 1st AND 2nd STAGE VOLTAGE (M57704L)



OUTPUT POWER VS. 1st AND 2nd STAGE VOLTAGE (M57704M)



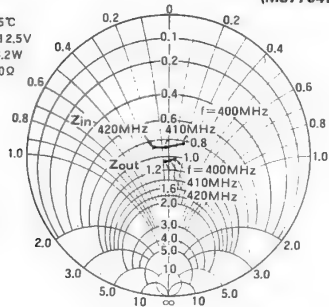
OUTPUT POWER VS. 1st AND 2nd STAGE VOLTAGE (M57704H)



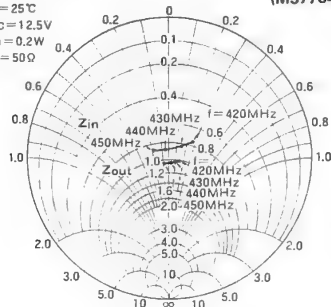
430~450MHz, 12.5V, 13W, FM MOBILE RADIO

INPUT IMPEDANCE OUTPUT IMPEDANCE
(M57704L)

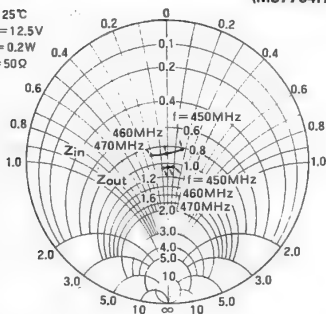
$T_0 = 25^\circ\text{C}$
 $V_{CC} = 12.5\text{V}$
 $P_{in} = 0.2\text{W}$
 $Z_0 = 50\Omega$

INPUT IMPEDANCE OUTPUT IMPEDANCE
(M57704M)

$T_0 = 25^\circ\text{C}$
 $V_{CC} = 12.5\text{V}$
 $P_{in} = 0.2\text{W}$
 $Z_0 = 50\Omega$

INPUT IMPEDANCE OUTPUT IMPEDANCE
(M57704H)

$T_0 = 25^\circ\text{C}$
 $V_{CC} = 12.5\text{V}$
 $P_{in} = 0.2\text{W}$
 $Z_0 = 50\Omega$



DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$$R_{th(j-c)1} = 15^{\circ}\text{C/W (Typ.)}$$

b) Second stage transistor

$$R_{th(j-c)2} = 6^{\circ}\text{C/W (Typ.)}$$

c) Final stage transistor

$$R_{th(j-c)3} = 2.5^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 13\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{In} = 0.2\text{W}$, $\eta_T = 35\%$ (minimum rating), P_{O1} (Note 1) = 1.5W , P_{O2} (2) = 6W , $I_T = 3.0\text{A}$ (I_{T1} (3) = 0.25A , I_{T2} (4) = 0.75A , I_{T3} (5) = 2.0A)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{In}) \times R_{th(j-c)1} + T_C^{(6)} \\ &= (12.5 \times 0.25 - 1.5 + 0.2) \times 15 + T_C \\ &= 27 + T_C (^{\circ}\text{C}) \end{aligned}$$

Note 6: Package temperature of device

- Junction temperature of the second stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_{O2} + P_{O1} \times R_{th(j-c)2} + T_C \\ &= (12.5 \times 0.75 - 6 + 1.5) \times 6 + T_C \\ &= 29 + T_C (^{\circ}\text{C}) \end{aligned}$$

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j3} &= (V_{CC} \times I_{T3} - P_O + P_{O2}) \times R_{th(j-c)3} + T_C \\ &= (12.5 \times 2.0 - 13 + 6) \times 2.5 + T_C \\ &= 45 + T_C (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep to package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 13W below 90°C .

The thermal resistance $R_{th(c-a)}^{(7)}$ of the heat sink to realize this:

$$R_{th(c-a)} = \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{In}} = \frac{90 - 60}{(13/0.35) - 13 + 0.2} = 1.2 (^{\circ}\text{C/W})$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 117^{\circ}\text{C}, T_{j2} = 119^{\circ}\text{C}, T_{j3} = 135^{\circ}\text{C} \text{ at } T_{j3} = 135^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_C = 90^{\circ}\text{C}.$$

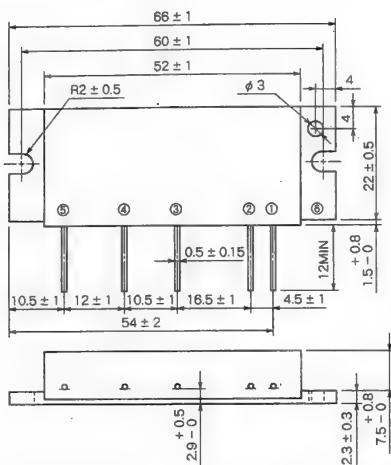
In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 87^{\circ}\text{C}, T_{j2} = 89^{\circ}\text{C}, T_{j3} = 105^{\circ}\text{C}.$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

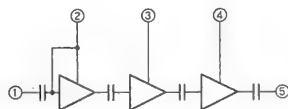
OUTLINE DRAWING

Dimensions in mm



H3A

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②VCC1 : 1st. DC SUPPLY
③VCC2 : 2nd. DC SUPPLY
④VCC3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

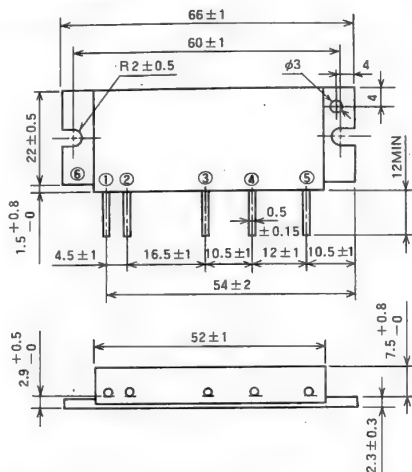
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		5	A
P _{in(max)}	Input power	Z _θ = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z _θ = Z _L = 50 Ω	20	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.2W$ $V_{cc} = 12.5V$ $Z_0 = Z_L = 50 \Omega$	430	450	MHz
Po	Output power		13		W
η_T	Total efficiency		35		%
2fo	2nd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 14W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50 \Omega$	No degradation		-

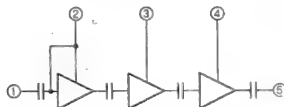
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

①Pin : RF INPUT

② VCC1 : 1st DC SUPPLY

③ VCC2 : 2nd. DC SUPPLY

④ Vcc3 : 3rd. DC SUPPLY

⑤ P0 : BF OUTPUT

⑤ PO : RF
⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

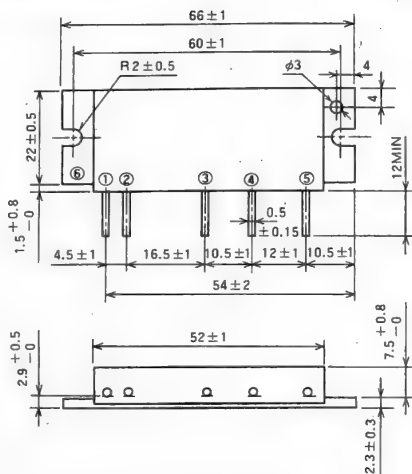
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		5	A
P _{in(max)}	Input power	Z _Θ = Z _L = 50 Ω	0.4	W
P _{O(max)}	Output power	Z _Θ = Z _L = 50 Ω	20	W
T _{c(OP)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

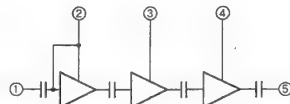
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.2W$ $V_{cc} = 12.5V$ $Z_0 = Z_L = 50 \Omega$	450	470	MHz
Po	Output power		13		W
η_T	Total efficiency		35		%
2fo	2nd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 14W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50 \Omega$	No degradation		-

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

① P_{in} : RF INPUT

②VCC1 : 1st. DC SUPPLY

③ VCC2 : 2nd. DC SUPPLY

④ VCC3 : 3rd. DC SUPPLY

⑤Po : RF OUTPUT

⑥ GND : FIN

H3

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

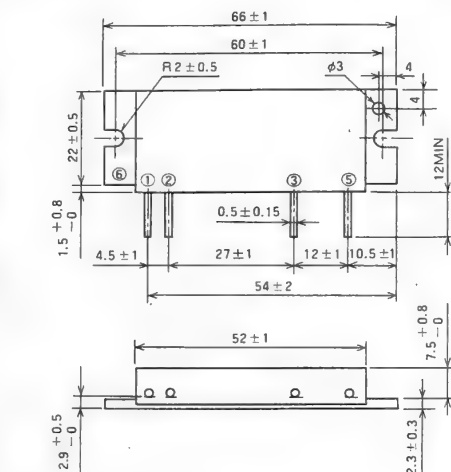
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		5	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	20	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

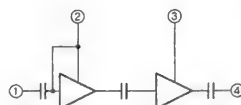
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.2W$ $V_{cc} = 12.5V$ $Z_G = Z_L = 50 \Omega$	470	490	MHz
Po	Output power		13		W
η_T	Total efficiency		35		%
2f _o	2nd. harmonic			-30	dB
ρ_{in}	Input VSWR		2.8	-	
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 14W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

- ① P_{in} : RF INPUT
- ② V_{CC1} : 1st. DC SUPPLY
- ③ V_{CC2} : 2nd. DC SUPPLY
- ④ P_o : RF OUTPUT
- ⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

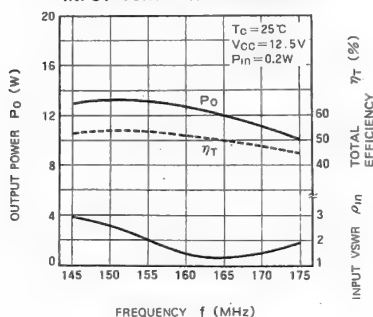
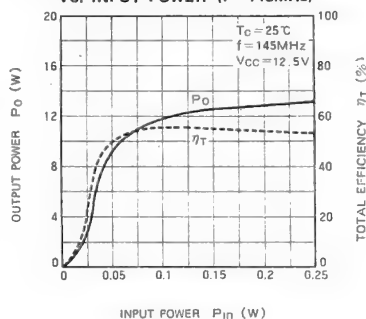
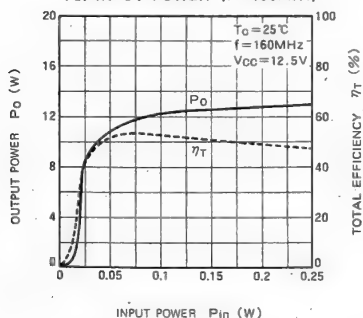
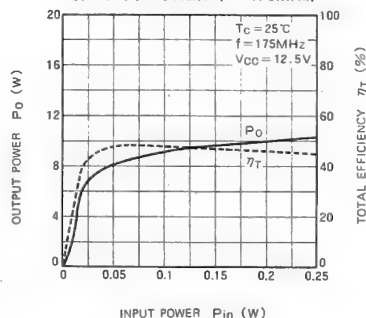
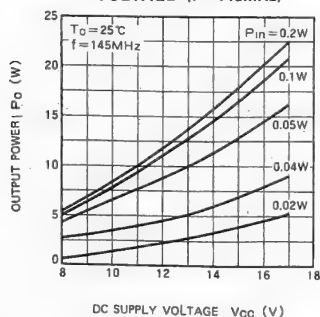
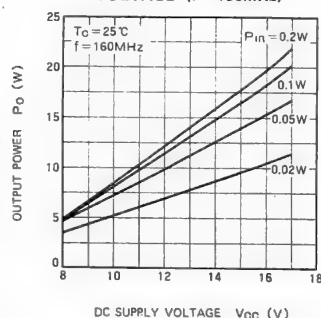
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		5	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	12	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

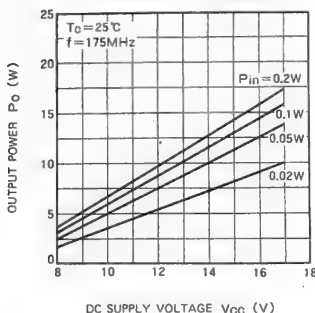
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max.	
f	Frequency range	P _{in} = 0.2W V _{cc} = 12.5V Z ₀ = Z _L = 50 Ω	135	145	MHz
P _o	Output power		8		W
η _T	Total efficiency		35		%
2f _o	2nd. harmonic				dB
3f _o	3rd. harmonic			-3	dB
ρ _{in}	Input VSWR			4	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 12W (P _{in} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z ₀ = 50Ω	No degradation		-

135~145MHz, 12.5V, 8W, FM MOBILE RADIO

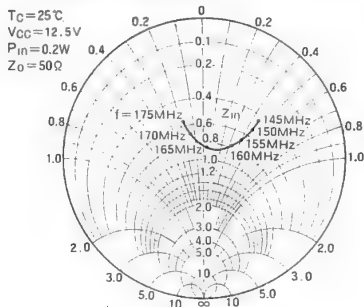
TYPICAL PERFORMANCE DATA (Typical performance datas of M57706 are shown under, Typical performance datas of M57706L are similar to these of M57706)

OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY

OUTPUT POWER, TOTAL EFFICIENCY, VS. INPUT POWER ($f = 145\text{MHz}$)

OUTPUT POWER, TOTAL EFFICIENCY, VS. INPUT POWER ($f = 160\text{MHz}$)

OUTPUT POWER, TOTAL EFFICIENCY, VS. INPUT POWER ($f = 175\text{MHz}$)

OUTPUT POWER VS. DC SUPPLY VOLTAGE ($f = 145\text{MHz}$)

OUTPUT POWER VS. DC SUPPLY VOLTAGE ($f = 160\text{MHz}$)


135~145MHz, 12.5V, 8W, FM MOBILE RADIO

OUTPUT POWER VS. DC SUPPLY VOLTAGE ($f = 175\text{MHz}$)

INPUT IMPEDANCE VS. FREQUENCY



DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$$R_{th(j-c)1} = 10^\circ\text{C/W (Typ.)}$$

b) Final stage transistor

$$R_{th(j-c)2} = 3^\circ\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 8\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{IN} = 0.2\text{W}$, $\eta_T = 35\%$ (minimum rating), P_{O1} (Note 1) = 1.8W , $I_T = 1.9\text{A}$ (I_{T1} (2) = 0.3A , I_{T2} (3) = 1.6A)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor
- $$T_{j1} = (V_{CC} \times I_{T1} - P_{O1} + P_{IN}) \times R_{th(j-c)1} + T_C$$
- $$= (12.5 \times 0.3 - 1.8 + 0.2) \times 10 + T_C$$
- $$= 22 + T_C (^\circ\text{C})$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$T_{j2} = (V_{CC} \times I_{T2} - P_O + P_{O1}) \times R_{th(j-c)2} + T_C$$

$$= (12.5 \times 1.6 - 8 + 1.8) \times 3 + T_C$$

$$= 42 + T_C (^\circ\text{C})$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^\circ\text{C}$) and at the output power of 8W below 90°C .

The thermal resistance $R_{th(c-a)}$ (5) of the heat sink to realize this:

$$\text{Note 5: } R_{th(c-a)} = \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{IN}} = \frac{90 - 60}{(8/0.35) - 8 + 0.2}$$

$$= 2.0 (^\circ\text{C/W})$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 122^\circ\text{C}, T_{j2} = 142^\circ\text{C} \text{ at } T_a = 60^\circ\text{C}, T_C = 90^\circ\text{C}.$$

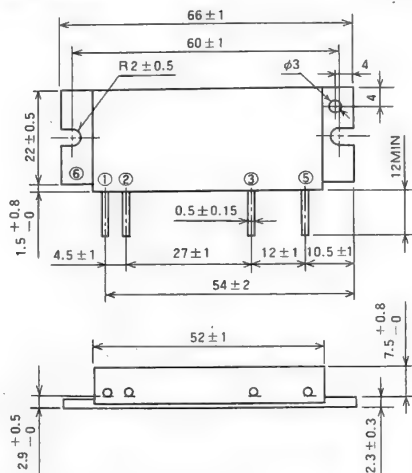
In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 92^\circ\text{C}, T_{j2} = 112^\circ\text{C}$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensure.

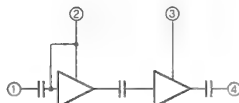
OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



PIN :

① Pin : RF INPUT

② VCC1 : 1st. DC SUPPLY

③ VCC2 : 2nd. DC SUPPLY

④ Po : RF OUTPUT

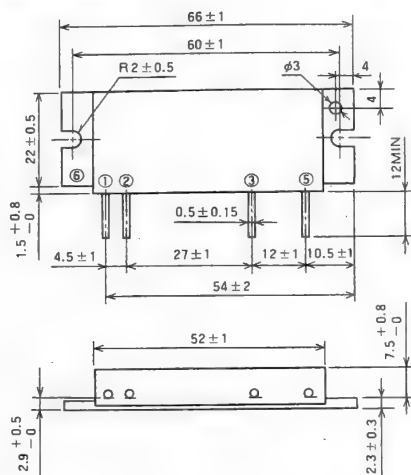
⑤ GND : FIN

Symbol	Parameter	Conditions	Rated	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		5	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	12	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.2W$ $V_{CC} = 12.5V$ $Z_G = Z_L = 50 \Omega$	145	175	MHz
Po	Output power		8		W
η_T	Total efficiency		35		%
2fo	2nd. harmonic			- 15	dB
3fo	3rd. harmonic			- 25	dB
ρ_{in}	Input VSWR			4	-
-	Load VSWR tolerance	$V_{CC} = 15.2V$, $P_o = 12W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50\Omega$	No degradation		-

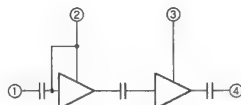
OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



PIN :

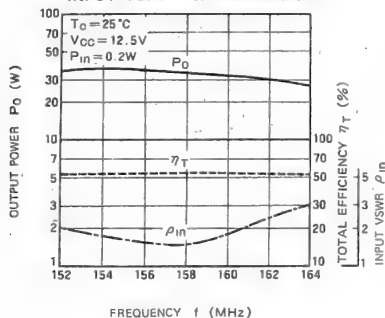
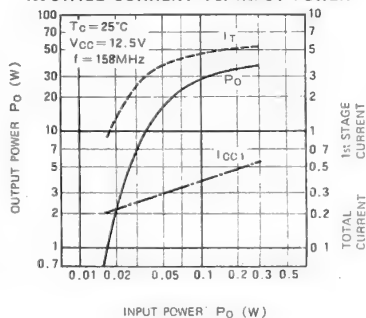
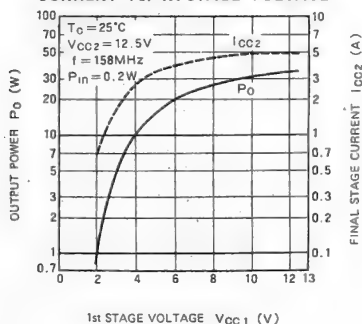
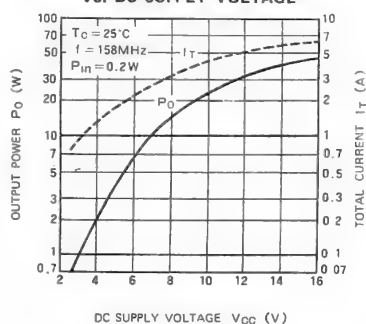
- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vcc2 : 2nd. DC SUPPLY
④Po : RF OUTPUT
⑤GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		7	A
P _{m(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	40	W
T _{c(OP)}	Operation case temperature		− 30 ~ 110	°C
T _{stg}	Storage temperature		− 40 ~ 110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.2W$ $V_{cc} = 12.5V$ $Z_G = Z_L = 50 \Omega$	156	160	MHz
Po	Output power		30		W
η_T	Total efficiency		45		%
2fo	2nd. harmonic			- 25	dB
3fo	3rd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 35W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 5sec. $Z_G = 50\Omega$	No degradation		-

156-160MHz, 12.5V, 30W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCYOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT POWEROUTPUT POWER, FINAL STAGE
CURRENT VS. 1st STAGE VOLTAGEOUTPUT POWER, TOTAL CURRENT
VS. DC SUPPLY VOLTAGE

DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 8^{\circ}\text{C/W (Typ.)}$$

- b) Final stage transistor

$$R_{th(j-c)2} = 2^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_o = 28\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.2\text{W}$, $\eta_T = 45\%$ (minimum rating), P_{O1} (Note 1) = 5W , $I_T = 5.0\text{A}$ (I_{T1} (2) = 0.9A , I_{T2} (3) = 4.1A)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_c^{(4)} \\ &= (12.5 \times 0.9 - 5 + 0.2) \times 8 + T_c \\ &= 52 + T_c (^{\circ}\text{C}) \end{aligned}$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_o + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 4.1 - 28 + 5) \times 2 + T_c \\ &= 57 + T_c (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 8W below 90°C .

The thermal resistance $R_{th(c-a)}$ (5) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_o/\eta_T) - P_o + P_{in}} = \frac{90 - 60}{(28/0.45) - 28 + 0.2} \\ &= 0.87 (^{\circ}\text{C/W}) \end{aligned}$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 142^{\circ}\text{C}, T_{j2} = 147^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 112^{\circ}\text{C}, T_{j2} = 117^{\circ}\text{C}$$

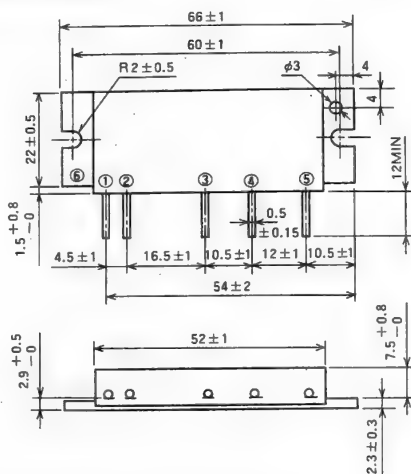
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensure.

M57713

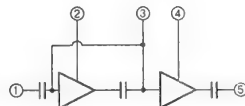
144~148MHz, 12.5V, 17W, MOBILE SSB RADIO

OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM

PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vbb : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

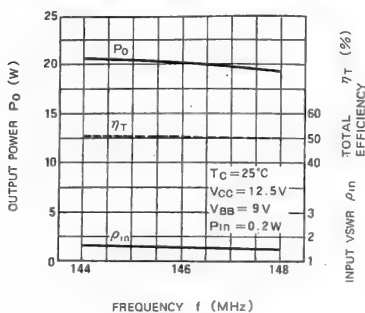
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
V _{bb}	Base bias		10	V
I _{cc}	Total current		6	A
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

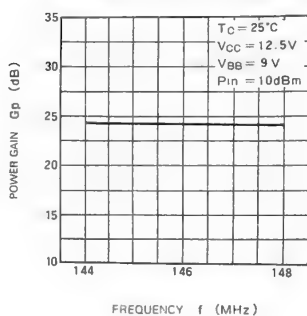
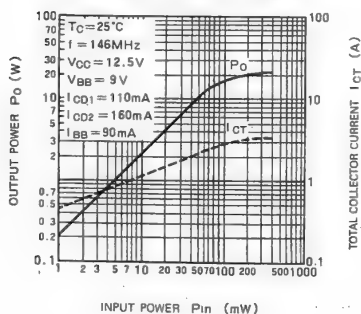
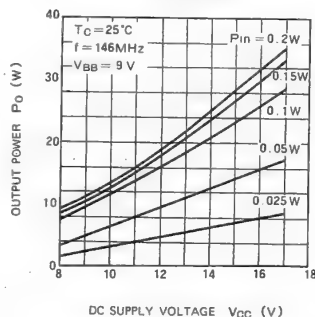
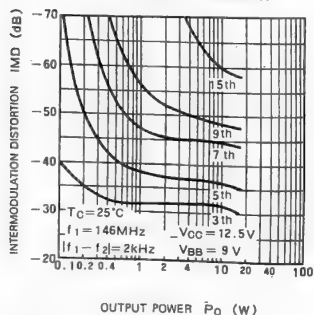
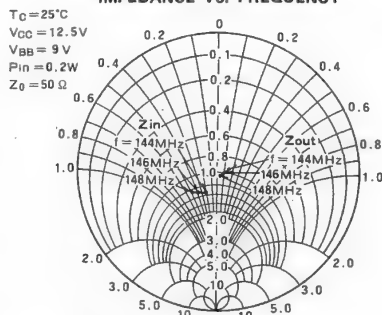
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		144	148	MHz
P _o	Output power	P _{in} = 0.2W	17		W
η _T	Total efficiency	V _{cc} = 12.5V	40		%
2f _o	2nd. harmonic	V _{bb} = 9V		-25	dB
3f _o	3rd. harmonic	Z _e = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.2	-
-	Load VSWR tolerance	V _{cc} = 15.2V, V _{bb} = 9V P _o = 14W (P _{in} : controlled) Load VSWR=20:1 (All phase) Z _e = 50 Ω	No degradation		-

144~148MHz, 12.5V, 17W, MOBILE SSB RADIO

TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY

POWER GAIN VS. FREQUENCY

OUTPUT POWER, TOTAL COLLECTOR
CURRENT VS. INPUT POWEROUTPUT POWER VS. SUPPLY
VOLTAGEINTERMODULATION DISTORTION
VS. OUTPUT POWERINPUT IMPEDANCE, OUTPUT
IMPEDANCE VS. FREQUENCY

DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 10^{\circ}\text{C/W (Typ.)}$$

- b) Final stage transistor

$$R_{th(j-c)2} = 2^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 14\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{IN} = 0.07\text{W}$, $\eta_T = 40\%$ (minimum rating), P_{O1} (Note 1) = 2.5W , $I_T = 2.8\text{A}$ (I_{T1} (2) = 0.5A , I_{T2} (3) = 2.3A)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{IN}) \times R_{th(j-c)1} + T_c^{(4)} \\ &= (12.5 \times 0.5 - 2.5 + 0.07) \times 10 + T_c \\ &= 39 + T_c (^{\circ}\text{C}) \end{aligned}$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_O + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 2.3 - 14 + 2.5) \times 2 + T_c \\ &= 35 + T_c (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 14W below 90°C .

The thermal resistance $R_{th(c-a)}$ (5) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{IN}} = \frac{90 - 60}{(14/0.4) - 14 + 0.07} \\ &= 1.42 (^{\circ}\text{C/W}) \end{aligned}$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 129^{\circ}\text{C}, T_{j2} = 125^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 99^{\circ}\text{C}, T_{j2} = 95^{\circ}\text{C}$$

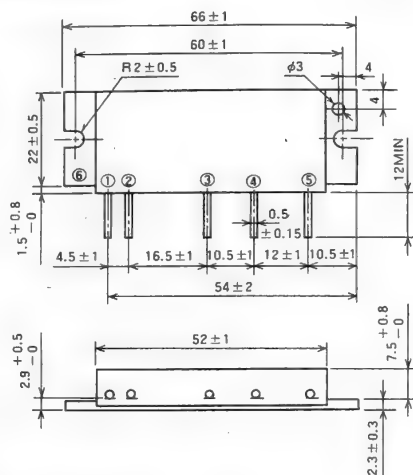
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

M57714EL

335~360MHz, 12.5V, 7W, FM MOBILE RADIO

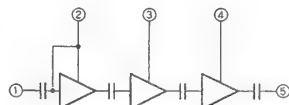
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ① P_{in} : RF INPUT
- ② V_{cc1} : 1st. DC SUPPLY
- ③ V_{cc2} : 2nd. DC SUPPLY
- ④ V_{cc3} : 3rd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.2	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	12	W
T _{c(OP)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise noted)

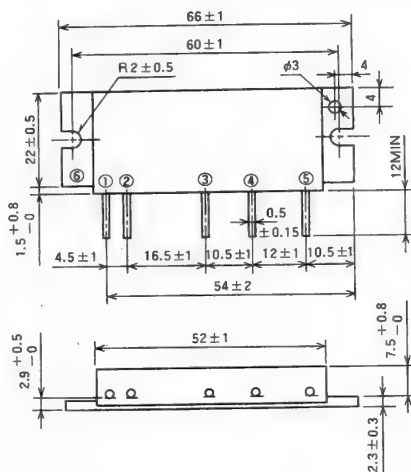
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		335	360	MHz
P _o	Output power	P _{in} = 0.1W	7		W
η _T	Total efficiency	V _{cc} = 12.5V	38		%
2f _o	2nd. harmonic	Z _G = Z _L = 50 Ω		- 30	dB
ρ _{in}	Input VSWR			2	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 7W (P _{in} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

M57714SL

360~380MHz, 12.5V, 7W, FM MOBILE RADIO

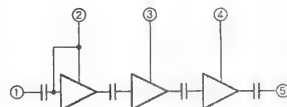
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ① P_{in} : RF INPUT
- ② V_{CC1} : 1st. DC SUPPLY
- ③ V_{CC2} : 2nd. DC SUPPLY
- ④ V_{CC3} : 3rd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.2	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	12	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

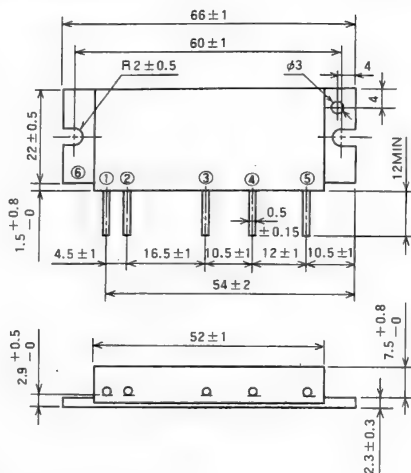
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.1W V _{cc} = 12.5V Z ₀ = Z _L = 50 Ω	360	380	MHz
P _o	Output power		7		W
η _T	Total efficiency		38		%
2f ₀	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

M57714UL

380~400MHz, 12.5V, 7W, FM MOBILE RADIO

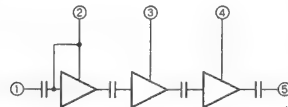
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

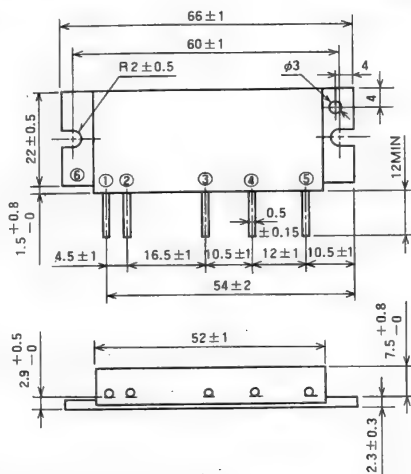
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.2	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	12	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.1W V _{cc} = 12.5V Z _G = Z _L = 50 Ω	380	400	MHz
P _o	Output power		7		W
η _T	Total efficiency		38		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

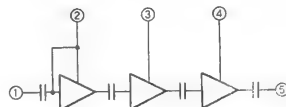
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



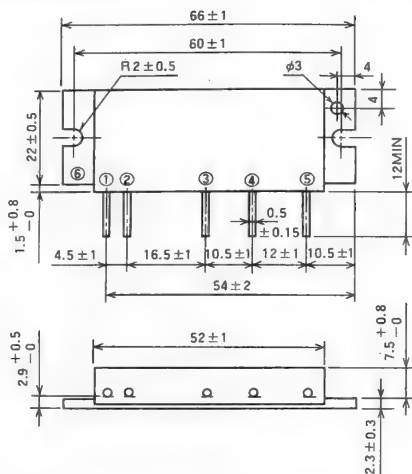
PIN :

- ①Pin : RF INPUT
②VCC1 : 1st. DC SUPPLY
③VCC2 : 2nd. DC SUPPLY
④VCC3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		4	A
P _{in(max)}	Input power	Z _θ = Z _L = 50 Ω	0.2	W
P _{o(max)}	Output power	Z _θ = Z _L = 50 Ω	12	W
T _{c(OP)}	Operation case temperature		−30~110	°C
T _{stg}	Storage temperature		−40~110	°C

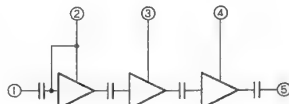
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.1W V _{cc} = 12.5V Z _G = Z _L = 50 Ω	400	420	MHz
P _o	Output power		7		W
η _T	Total efficiency		38		%
2f _o	2nd. harmonic			- 30	dB
ρ _{in}	Input VSWR			2	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

①P_{in} : RF INPUT

② VCC1 : 1st. DC SUPPLY

③ Vcc2 : 2nd. DC SUPPLY

④ VCC3 : 3rd. DC SUPPLY

⑤ P_Q : RF OUTPUT

⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

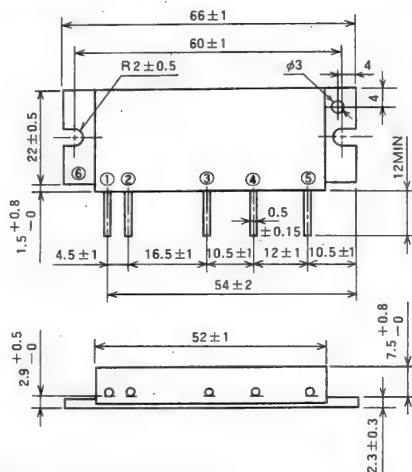
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.2	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	12	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~+110	°C

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.1W$ $V_{cc} = 12.5V$ $Z_0 = Z_L = 50 \Omega$	430	450	MHz
Po	Output power		7		W
η_T	Total efficiency		38		%
2fo	2nd. harmonic			-30	dB
p _{in}	Input VSWR			2	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 7W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50 \Omega$	No degradation		-

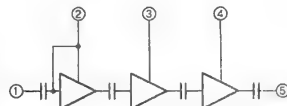
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

① Pin : RF INPUT

② Vcc1 : 1st. DC SUPPLY

③ Vcc2 : 2nd. DC SUPPLY

④ Vcc3 : 3rd. DC SUPPLY

⑤ Po : RF OUTPUT

⑥ GND : FIN

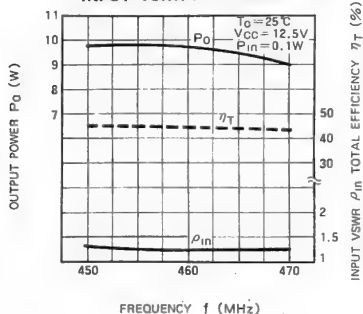
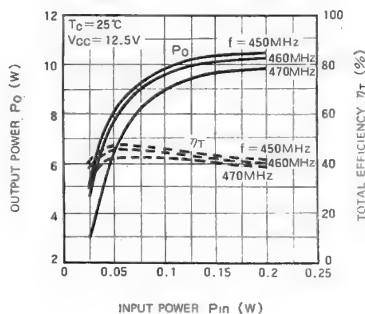
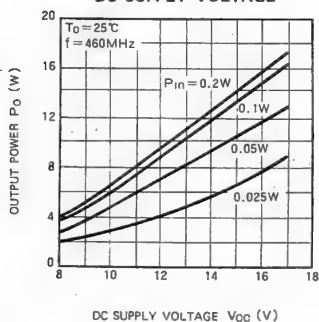
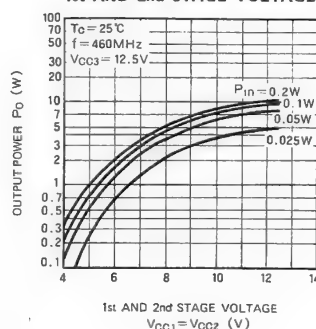
ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.2	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	12	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

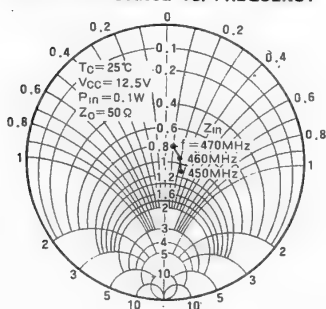
ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		450	470	MHz
P _o	Output power	P _{in} = 0.1W	7		W
η _T	Total efficiency	V _{cc} = 12.5V	38		%
2f _o	2nd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

TYPICAL PERFORMANCE DATA

OUTPUT POWER TOTAL EFFICIENCY
INPUT VSWR FREQUENCY

OUTPUT POWER TOTAL
EFFICIENCY VS. INPUT POWER

OUTPUT POWER VS.
DC SUPPLY VOLTAGE

OUTPUT POWER
1st AND 2nd STAGE VOLTAGE


INPUT IMPEDANCE VS. FREQUENCY



DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 20^{\circ}\text{C/W (Type)}$$

- b) Second stage transistor

$$R_{th(j-c)2} = 10^{\circ}\text{C/W (Type)}$$

- c) Final stage transistor

$$R_{th(j-c)3} = 5^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 7\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{IN} = 0.1\text{W}$, $\eta_T = 38\%$ (minimum rating), P_{O1} (Note 1) = 0.8W , P_{O2} (2) = 3.2W , $I_T = 1.47\text{A}$ (I_{T1} (3) = 0.12A , I_{T2} (4) = 0.42A , I_{T3} (5) = 0.93A)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{IN}) \times R_{th(j-c)1} + T_c^{(6)} \\ &= (12.5 \times 0.12 - 0.8 + 0.1) \times 20 + T_c \\ &= 16 + T_c (^{\circ}\text{C}) \end{aligned}$$

Note 6: Package temperature of device

Junction temperature of the second stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 0.42 - 3.2 + 0.8) \times 10 + T_c \\ &= 29 + T_c (^{\circ}\text{C}) \end{aligned}$$

Junction temperature of the final stage transistor

$$\begin{aligned} T_{j3} &= (V_{CC} \times I_{T3} - P_O + P_{O2}) \times R_{th(j-c)3} + T_c \\ &= (12.5 \times 0.93 - 7 + 3.2) \times 5 + T_c \\ &= 39 + T_c (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 7W below 90°C .

The thermal resistance $R_{th(c-a)}$ (7) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{IN}} = \frac{90 - 60}{(7/0.38) - 7 + 0.1} \\ &= 2.6 (^{\circ}\text{C/W}) \end{aligned}$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 106^{\circ}\text{C}, T_{j2} = 119^{\circ}\text{C}, T_{j3} = 129^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

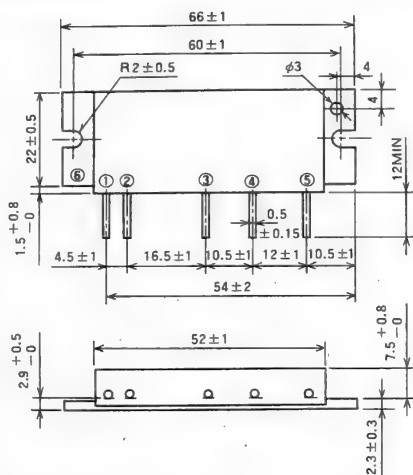
In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 76^{\circ}\text{C}, T_{j2} = 89^{\circ}\text{C}, T_{j3} = 99^{\circ}\text{C}.$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

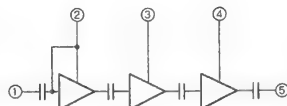
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②VCC1 : 1st. DC SUPPLY
③VCC2 : 2nd. DC SUPPLY
④VCC3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		4	A
P _{in(max)}	Input power	Z _Θ = Z _L = 50 Ω	0.2	W
P _{O(max)}	Output power	Z _Θ = Z _L = 50 Ω	12	W
T _{C(OP)}	Operation case temperature		− 30~110	°C
T _{stg}	Storage temperature		− 40~110	°C

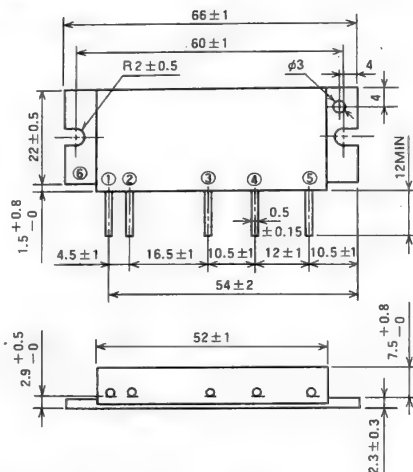
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.1W$ $V_{CC} = 12.5$ $V_{ZG} = Z_L = 50 \Omega$	470	490	MHz
Po	Output power		7		W
η_T	Total efficiency		38		%
2fo	2nd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2	-
-	Load VSWR tolerance	$V_{CC} = 15.2V$, $P_o = 7W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

M57714SH

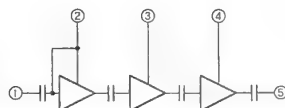
490~512MHz, 12.5V, 7W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

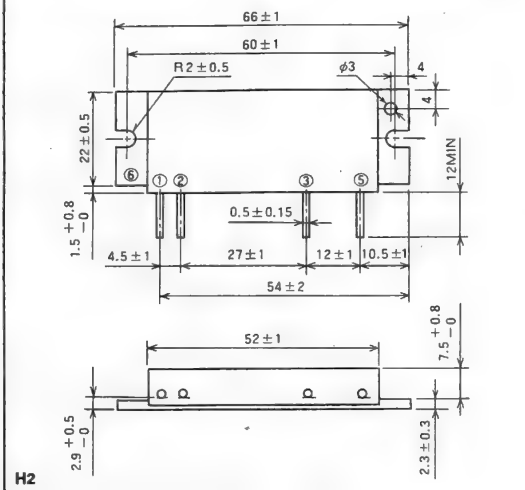
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		4	A
P _{in} (max)	Input power	Z _g = Z _L = 50 Ω	0.2	W
P _o (max)	Output power	Z _g = Z _L = 50 Ω	12	W
T _c (op)	Operation case temperature		-30~110	°C
T _{sig}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

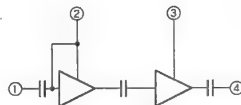
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.1W Vcc = 12.5V Z _g = Z _L = 50 Ω	490	512	MHz
P _o	Output power		7		W
η _T	Total efficiency		38		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2	-
-	Load VSWR tolerance	Vcc = 15.2V, P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _g = 50 Ω	No degradation		-

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Po : RF OUTPUT
- ⑤GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

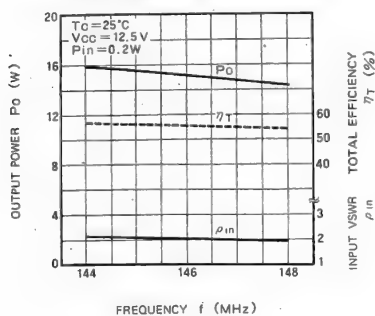
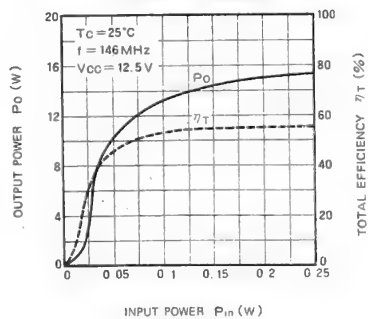
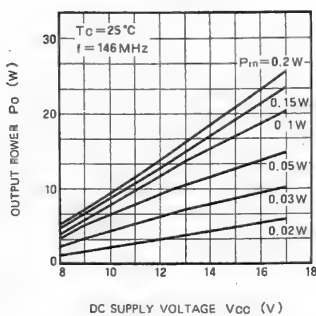
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
T _{cop}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

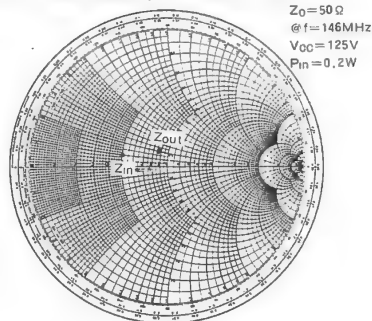
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		144	148	MHz
P _o	Output power		13		W
η _T	Total efficiency	P _{in} = 0.2W Vcc = 12.5V	48		%
2f _o	2nd. harmonic	Z _G = Z _L = 50 Ω		-25	dB
3f _o	3rd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V, P _o = 14W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50Ω	No degradation		-

144-148MHz, 12.5V, 13W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCYOUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWEROUTPUT POWER VS. DC SUPPLY
VOLTAGE

INPUT IMPEDANCE, OUTPUT IMPEDANCE



DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 10^{\circ}\text{C/W (Typ.)}$$

- b) Final stage transistor

$$R_{th(j-c)2} = 3^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_o = 13\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.2\text{W}$, $\eta_T = 48\%$ (minimum rating), P_{O1} (Note 1) = 2.5W , $I_T = 2.2\text{A}$ (I_{T1} (2) = 0.45A , I_{T2} (3) = 1.75A)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_c^{(4)} \\ &= (12.5 \times 0.45 - 2.5 + 0.2) \times 10 + T_c \\ &= 33 + T_c (^{\circ}\text{C}) \end{aligned}$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_o + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 1.75 - 13 + 2.5) \times 3 + T_c \\ &= 34 + T_c (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 8W below 90°C .

The thermal resistance $R_{th(c-a)}$ (5) of the heat sink to realize this:

$$R_{th(c-a)} = \frac{T_c - T_a}{(P_o/\eta_T) - P_o + P_{in}} = \frac{90 - 60}{(13/0.48) - 13 + 0.2} = 2.8 (^{\circ}\text{C})$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 113^{\circ}\text{C}, T_{j2} = 134^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 33°C ,

$$T_{j1} = 103^{\circ}\text{C}, T_{j2} = 104^{\circ}\text{C}$$

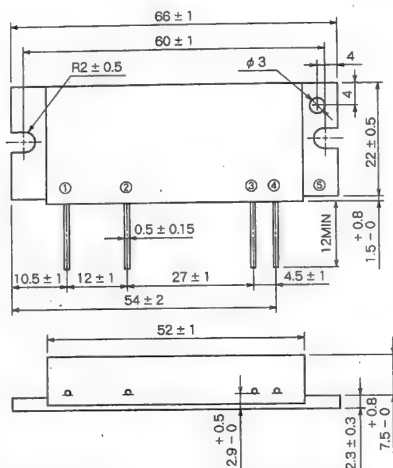
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensure.

M57715R

144~148MHz, 12.5V, 13W, FM MOBILE RADIO

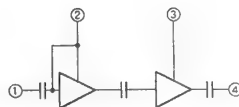
OUTLINE DRAWING

Dimensions in mm



H2R

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Po : RF OUTPUT
- ⑤GND : PIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

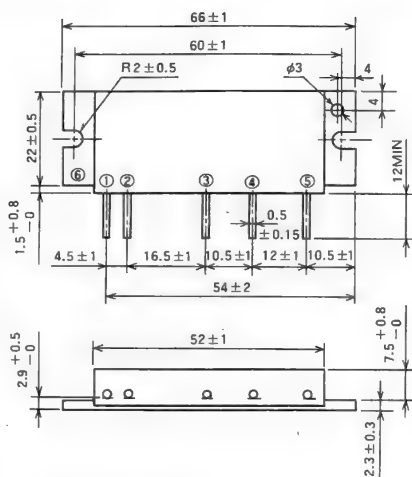
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		5	A
P _{in(max)}	Input power	Z _g = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z _g = Z _L = 50 Ω	20	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		144	148	MHz
P _o	Output power	P _{in} = 0.2W	13		W
η _T	Total efficiency	V _{cc} = 12.5V	48		%
2f _o	2nd. harmonic	Z _g = Z _L = 50 Ω		-25	dB
3f _o	3rd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 14W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _g = 50Ω	No degradation		-

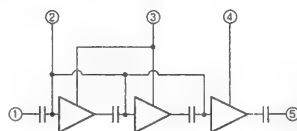
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②V_{BB} : BASE BIAS
- ③V_{CC1} : 1st. DC SUPPLY
- ④V_{CC2} : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

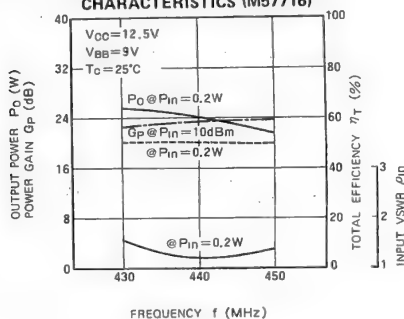
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
V _{BB}			10	V
I _{CC}	Total current		6	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.3	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	28	W
T _{c(op)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise noted)

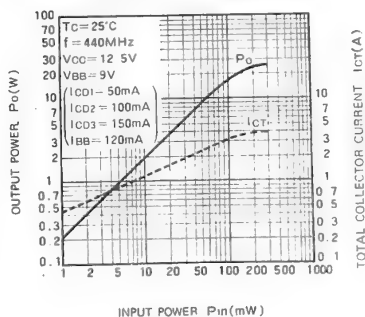
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.2W V _{CC} = 12.5V V _{BB} = 9V Z ₀ = Z _L = 50 Ω	430	450	MHz
P _o	Output power		17		W
η _T	Total efficiency		35		%
2f ₀	2nd. harmonic			- 30	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{CC} = 15.2V, V _{BB} = 9V P _o = 14W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

TYPICAL PERFORMANCE DATA

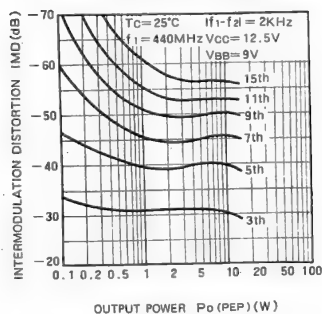
OUTPUT POWER, POWER GAIN, TOTAL EFFICIENCY, INPUT VSWR-FREQUENCY CHARACTERISTICS (M57716)



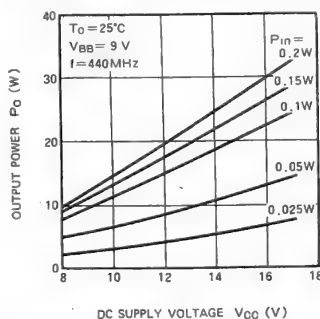
OUTPUT POWER, TOTAL COLLECTOR CURRENT VS. INPUT POWER

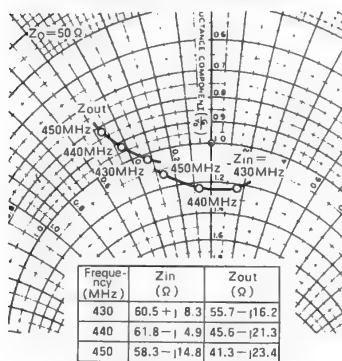


INTERMODULATION DISTORTION VS. OUTPUT POWER



OUTPUT POWER VS. DC SUPPLY VOLTAGE



INPUT IMPEDANCE, OUTPUT
IMPEDANCE VS. FREQUENCY

Test condition: $V_{CC}=12.5V$, $V_{BB}=9V$
 $P_{IN}=0.2W$

DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$$R_{th(j-c)1} = 15^{\circ}C/W \text{ (Typ.)}$$

b) Second stage transistor

$$R_{th(j-c)2} = 6^{\circ}C/W \text{ (Typ.)}$$

c) Final stage transistor

$$R_{th(j-c)3} = 2^{\circ}C/W \text{ (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 14W$, $V_{CC} = 12.5V$, $P_{IN} = 80mW$, $\eta_T = 35\%$ (minimum rating), P_{O1} (Note 1) = $1W$, P_{O2} (2) = $4.5W$, $I_T = 3.2A$ (I_{T1} (3) = $0.15A$, I_{T2} (4) = $0.55A$, I_{T3} (5) = $2.5A$)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$T_{j1} = (V_{CC} \times I_{T1} - P_{O1} + P_{IN}) \times R_{th(j-c)1} + T_C^{(6)}$$

$$= (12.5 \times 0.15 - 1 + 0.08) \times 15 + T_C$$

$$= 14.4 + T_C \text{ (}^{\circ}C\text{)}$$

Note 6: Package temperature of device

- Junction temperature of the second stage transistor

$$T_{j2} = (V_{CC} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_C$$

$$= (12.5 \times 0.55 - 4.5 + 1) \times 6 + T_C$$

$$= 20.3 + T_C \text{ (}^{\circ}C\text{)}$$

- Junction temperature of the final stage transistor

$$T_{j3} = (V_{CC} \times I_{T3} - P_O + P_{O2}) \times R_{th(j-c)3} + T_C$$

$$= (12.5 \times 2.5 - 14 + 4.5) \times 2 + T_C$$

$$= 43.5 + T_C \text{ (}^{\circ}C\text{)}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}C$) and at the output power of 14W below $90^{\circ}C$.

The thermal resistance $R_{th(c-a)}^{(7)}$ of the heat sink to realize this:

$$\text{Note 7: } R_{th(c-a)} = \frac{T_C - T_a}{(P_O/\eta_T) - P_O + P_{IN}} = \frac{90 - 60}{(14/0.35) - 14 + 0.08}$$

$$= 1.15 \text{ (}^{\circ}C/W\text{)}$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink.

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 104.4^{\circ}C, T_{j2} = 110.3^{\circ}C, T_{j3} = 133.5^{\circ}C \text{ at } T_a = 60^{\circ}C, T_C = 90^{\circ}C.$$

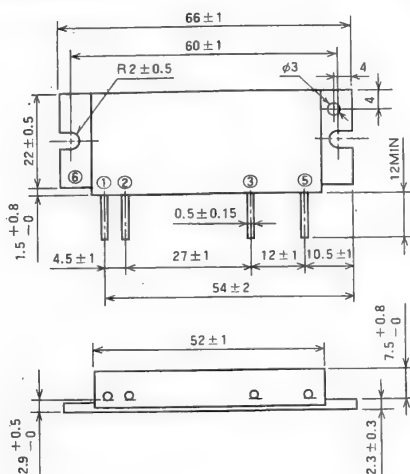
In the annual average of ambient temperature is $30^{\circ}C$,

$$T_{j1} = 74.4^{\circ}C, T_{j2} = 80.3^{\circ}C, T_{j3} = 103.5^{\circ}C.$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are $175^{\circ}C$, application under fully derated condition is ensured.

OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



PIN :

① P_{in} : RF INPUT

② VCC1 : 1st. DC SUPPLY

③ VCC2 : 2nd DC SUPPLY

④Po : RF OUTPUT

⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C unless otherwise noted)

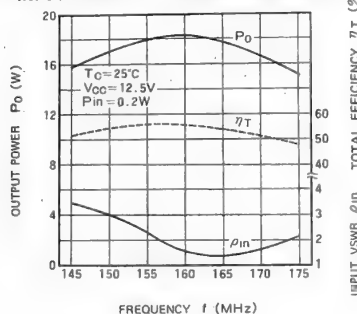
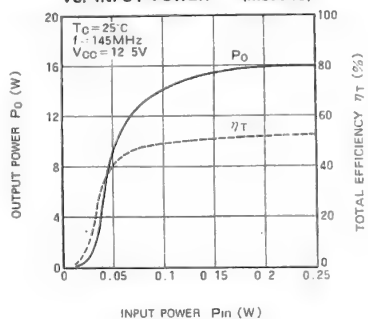
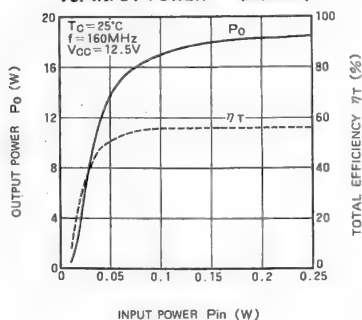
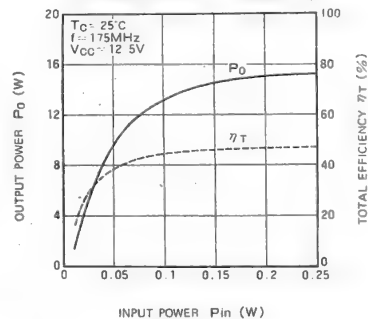
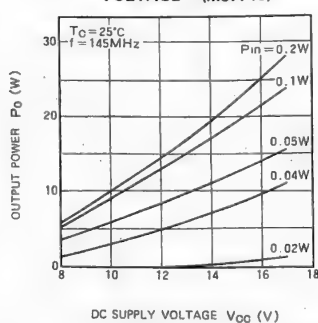
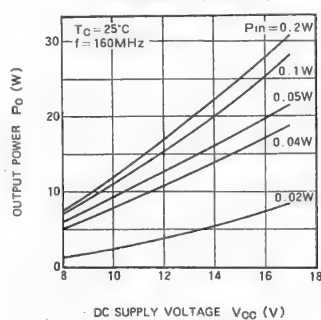
Symbol	Parameter	Conditions	Rating	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		6	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	20	W
T _{C(OP)}	Operation case temperature		− 30 ~ 110	°C
T _{stg}	Storage temperature		− 40 ~ 110	°C

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

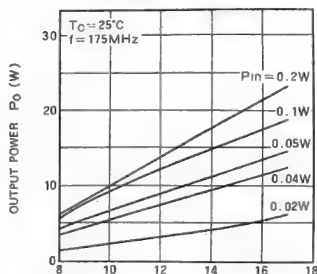
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.2W$ $V_{cc} = 12.5V$ $Z_0 = Z_L = 50 \Omega$	135	145	MHz
P_o	Output power		14		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			- 25	dB
3fo	3rd. harmonic			- 35	dB
ρ_{in}	Input VSWR			4	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 14W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50\Omega$	No degradation		-

142~163MHz, 12.5V, 14W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

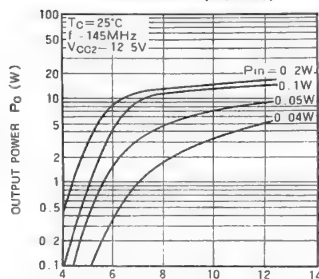
OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY (M57719)OUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWER (M57719)OUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWER (M57719)OUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWER (M57719)OUTPUT POWER VS. DC SUPPLY
VOLTAGE (M57719)OUTPUT POWER VS. DC SUPPLY
VOLTAGE (M57719)

OUTPUT POWER VS. DC SUPPLY
VOLTAGE (M57719)



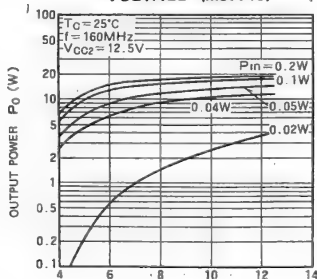
DC SUPPLY VOLTAGE V_{CC} (V)

OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57719)



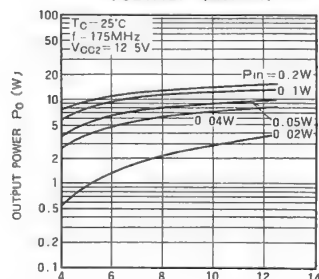
1st STAGE VOLTAGE V_{CC1} (V)

OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57719)



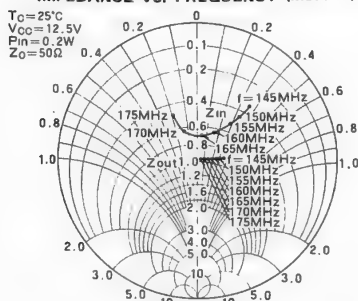
1st STAGE VOLTAGE V_{CC1} (V)

OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57719)

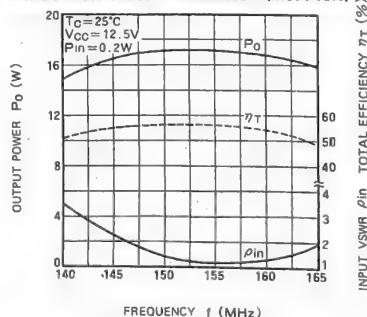


1st STAGE VOLTAGE V_{CC1} (V)

OUTPUT IMPEDANCE, INPUT
IMPEDANCE VS. FREQUENCY (M57719)

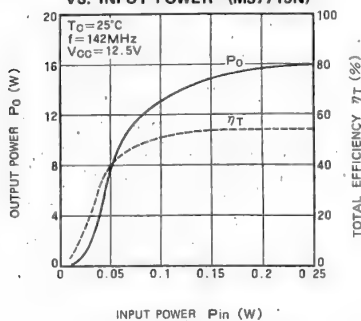


OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY (M57719N)

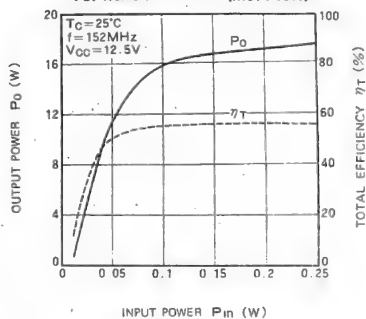


FREQUENCY f (MHz)

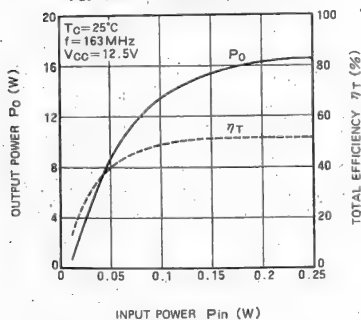
OUTPUT POWER, TOTAL EFFICIENCY
VS. INPUT POWER (M57719N)



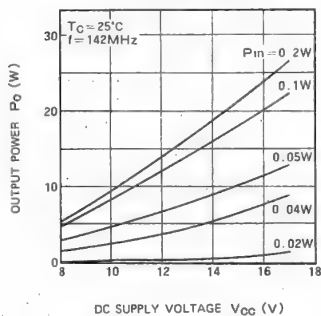
OUTPUT POWER, TOTAL EFFICIENCY
VS. INPUT POWER (M57719N)



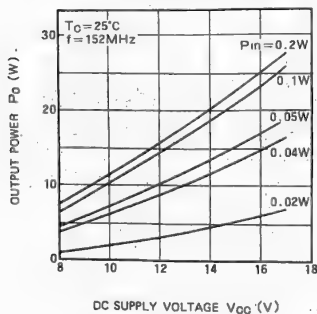
OUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWER (M57719N)



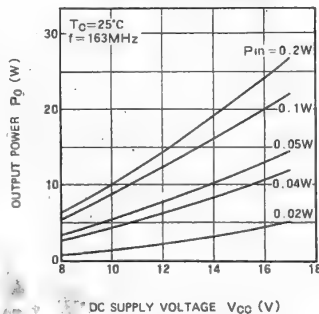
OUTPUT POWER VS. DC SUPPLY
VOLTAGE (M57719N)



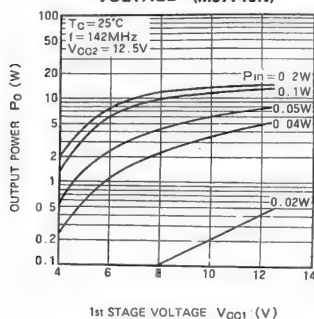
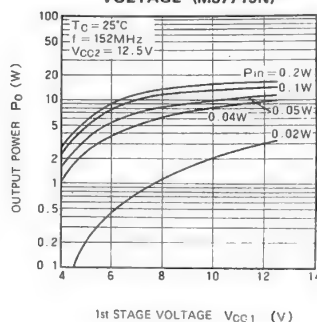
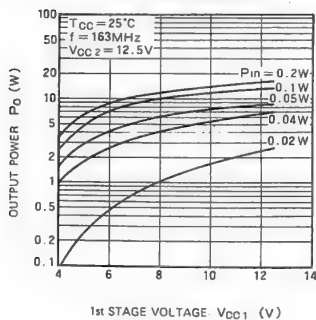
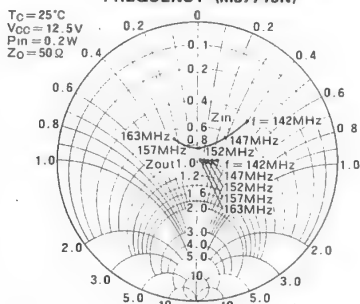
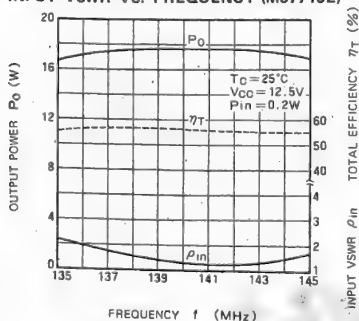
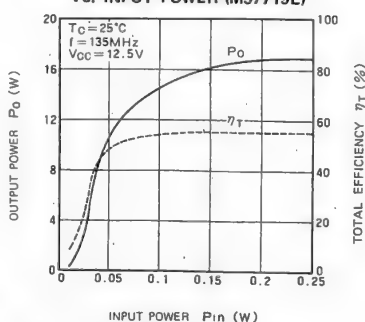
OUTPUT POWER VS. SUPPLY
VOLTAGE (M57719N)



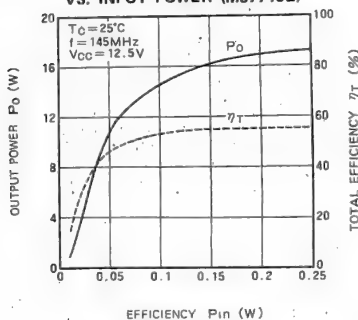
OUTPUT POWER VS. DC SUPPLY
VOLTAGE (M57719N)



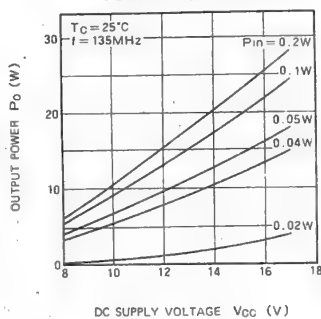
142~163MHz, 12.5V, 14W, FM MOBILE RADIO

OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57719N)OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57719N)OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57719N)OUTPUT IMPEDANCE, INPUT IMPEDANCE VS.
FREQUENCY (M57719N)OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY (M57719L)OUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWER (M57719L)

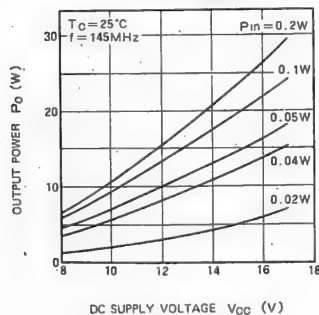
OUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWER (M57719L)



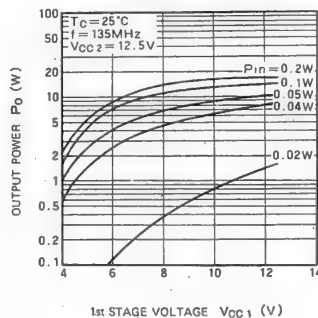
OUTPUT POWER VS. DC SUPPLY
VOLTAGE (M57719L)



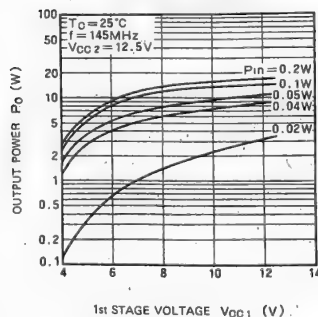
OUTPUT POWER VS. DC SUPPLY
VOLTAGE (M57719L)



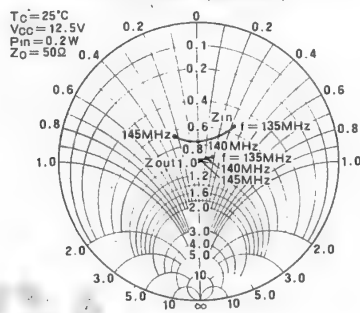
OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57719L)



OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57719L)



INPUT IMPEDANCE, OUTPUT IMPEDANCE VS.
FREQUENCY (M57719L)



DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 10^{\circ}\text{C/W (Typ.)}$$

- b) Final stage transistor

$$R_{th(j-c)2} = 3^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 14\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.2\text{W}$, $\eta_T = 40\%$ (minimum rating), P_{O1} (Note 1) = 2.5W , $I_T = 2.8\text{A}$ (I_{T1} (2) = 0.5A , I_{T2} (3) = 2.3A)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor:

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_c^{(4)} \\ &= (12.5 \times 0.5 - 2.5 + 0.2) \times 10 + T_c \\ &= 39.5 + T_c (^{\circ}\text{C}) \end{aligned}$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_O + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 2.3 - 14 + 2.5) \times 3 + T_c \\ &= 51.8 + T_c (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 14W below 90°C .

The thermal resistance $R_{th(c-a)}$ (5) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{in}} = \frac{90 - 60}{(14/0.40) - 14 + 0.2} \\ &= 1.9 (^{\circ}\text{C/W}) \end{aligned}$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 140^{\circ}\text{C}, T_{j2} = 152^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 110^{\circ}\text{C}, T_{j2} = 122^{\circ}\text{C}$$

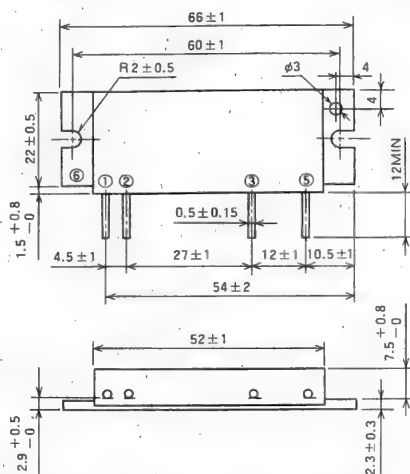
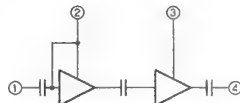
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

M57719

145~175MHz, 12.5V, 14W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm

**H2****BLOCK DIAGRAM****PIN :**

- ① P_{in} : RF INPUT
- ② V_{cc1} : 1st. DC SUPPLY
- ③ V_{cc2} : 2nd. DC SUPPLY
- ④ P_o : RF OUTPUT
- ⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

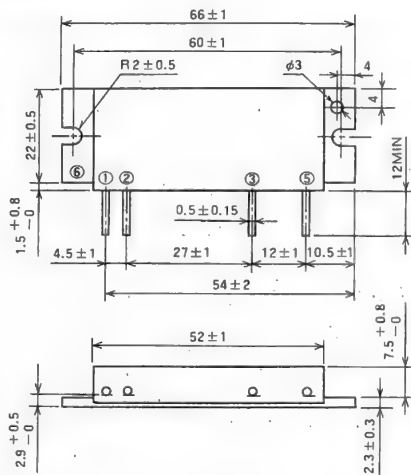
Symbol	Parameter	Conditions	Ratings	Unit
V_{cc}	Supply voltage		17	V
I_{cc}	Total current		6	A
$P_{in(max)}$	Input power	$Z_g = Z_L = 50\ \Omega$	0.4	W
$P_{o(max)}$	Output power	$Z_g = Z_L = 50\ \Omega$	20	W
$T_{c(OP)}$	Operation case temperature		-30~110	$^\circ\text{C}$
T_{stg}	Storage temperature		-40~110	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

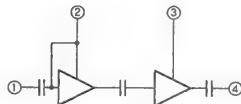
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		145	175	MHz
P_o	Output power	$P_{in} = 0.2\text{W}$	14		W
η_T	Total efficiency	$V_{cc} = 12.5\text{V}$	40		%
2fo	2nd. harmonic	$Z_g = Z_L = 50\ \Omega$		-25	dB
3fo	3rd. harmonic			-35	dB
ρ_{in}	Input VSWR			4	-
-	Load VSWR tolerance	$V_{cc} = 15.2\text{V}$, $P_o = 14\text{W}$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_g = 50\ \Omega$	No degradation		-

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

① P_{in} : RF INPUT

②VCC1 : 1st. DC SUPPLY

③ VCC2 : 2nd. DC SUPPLY

④Po : RF OUTPUT

⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

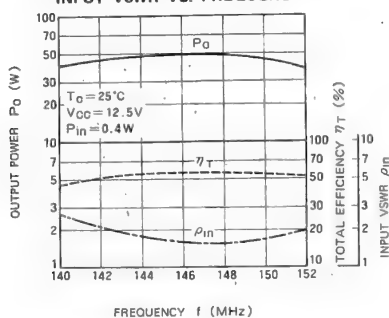
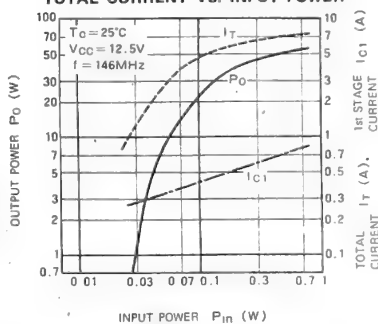
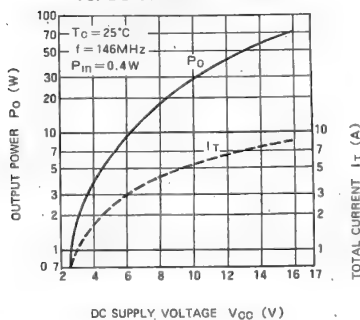
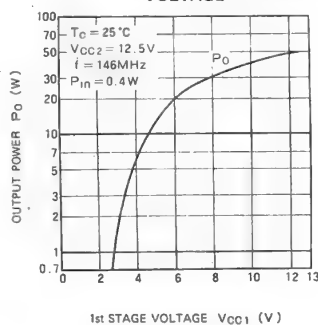
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		14	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.6	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	55	W
T _{C(OP)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.3W$ $V_{CC} = 12.5V$ $Z_G = Z_L = 50 \Omega$	144	148	MHz
Po	Output power		43		W
η_T	Total efficiency		50		%
2fo	2nd. harmonic			-35	dB
3fo	3rd. harmonic			-45	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{CC} = 15.2V$, $P_o = 45W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 5sec. $Z_G = 50\Omega$	No degradation		-

144-148MHz, 12.5V, 43W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCYOUTPUT POWER, 1st STAGE CURRENT
TOTAL CURRENT VS. INPUT POWEROUTPUT POWER, TOTAL CURRENT
VS. DC SUPPLY VOLTAGEOUTPUT POWER VS. 1st STAGE
VOLTAGE

DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$$R_{th(j-c)1} = 4.3^{\circ}\text{C/W (Typ.)}$$

b) Final stage transistor

$$R_{th(j-c)2} = 1.5^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_o = 43\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.4\text{W}$, $\eta_T = 50\%$ (minimum rating), P_{o1} (Note 1) = 9.4W , $I_T = 6.88\text{A}$ (I_{T1} (2) = 1.25A , I_{T2} (3) = 5.63A)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{o1} + P_{in}) \times R_{th(j-c)1} + T_c \text{ (4)} \\ &= (12.5 \times 1.25 - 9.4 + 0.4) \times 4.3 + T_c \\ &= 28.5 + T_c \text{ (}^{\circ}\text{C)} \end{aligned}$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_o + P_{o1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 5.63 - 43 + 9.4) \times 1.5 + T_c \\ &= 55.2 + T_c \text{ (}^{\circ}\text{C)} \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 43W below 90°C .

The thermal resistance $R_{th(c-a)}$ (5) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_o/\eta_T) - P_o + P_{in}} = \frac{90 - 60}{(43/0.5) - 43 + 0.4} \\ &= 0.69 \text{ (}^{\circ}\text{C/W)} \end{aligned}$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 118.5^{\circ}\text{C}, T_{j2} = 145.2^{\circ}\text{C at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

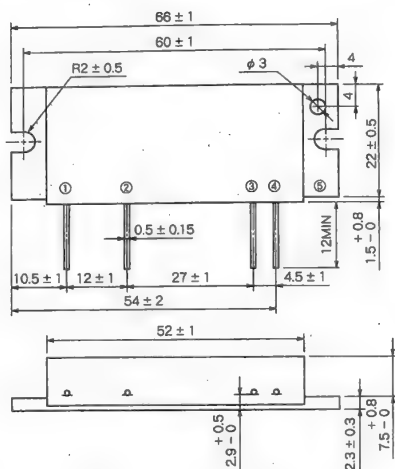
In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 88.5^{\circ}\text{C}, T_{j2} = 115.2^{\circ}\text{C}$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

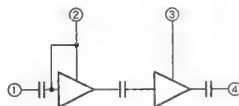
OUTLINE DRAWING

Dimensions in mm



H2R

BLOCK DIAGRAM



PIN :

① P_{in} : RF INPUT

②V_{CC1} : 1st DC SUPPLY

③ VCC2 : 2nd. DC SUPPLY

④Po : RF OUTPUT

⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

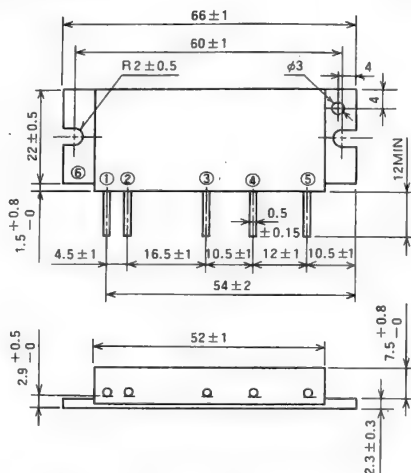
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		14	A
P _{in(max)}	Input power	Z _Θ = Z _L = 50 Ω	0.6	W
P _{O(max)}	Output power	Z _Θ = Z _L = 50 Ω	55	W
T _{C(OP)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.3W$ $V_{cc} = 12.5V$ $Z_{\alpha} = Z_L = 50 \Omega$	144	148	MHz
Po	Output power		43		W
η_T	Total efficiency		50		%
2fo	2nd. harmonic			- 35	dB
3fo	3rd. harmonic			- 45	dB
pIn	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 45W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 5sec. $Z_0 = 50\Omega$	No degradation		-

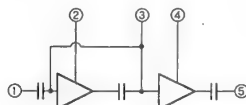
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

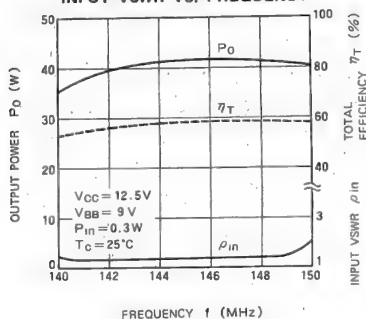
- ①Pin : RF INPUT
②VCC1 : 1st. DC SUPPLY
③VBB : BASE BIAS
④VCC2 : 2nd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Rating	Unit
V _{CC}	Supply voltage		17	V
V _{BB}	Base bias		10	V
I _{CC}	Total current		10	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.5	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	40	W
T _{c(OP)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

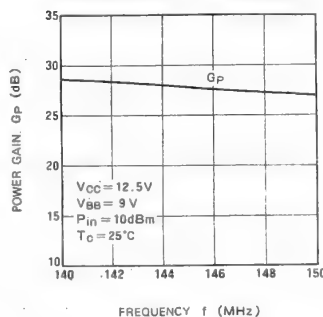
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.3W$ $V_{CC} = 12.5V$ $V_{BB} = 9V$ $Z_{\theta} = Z_L = 50 \Omega$	144	148	MHz
Po	Output power		37		W
η_T	Total efficiency		50		%
2fo	2nd. harmonic			- 25	dB
3fo	3rd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.2	-
-	Load VSWR tolerance	$V_{CC} = 15.2V$, $V_{BB} = 9V$ $P_o = 30W$ (P_{in} : controlled) Load VSWR $\geq 20:1$ (All phase), 5sec. $Z_{\theta} = 50 \Omega$	No degradation		-

TYPICAL PERFORMANCE DATA

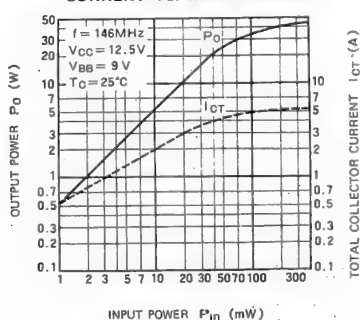
OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY



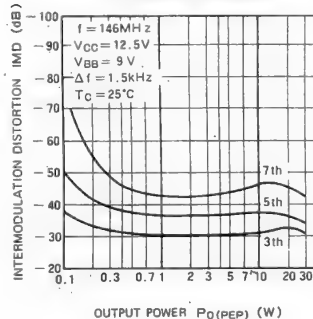
POWER GAIN VS. FREQUENCY



OUTPUT POWER, TOTAL COLLECTOR
CURRENT VS. INPUT POWER



INTERMODULATION DISTORTION
VS. OUTPUT POWER



DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$$R_{th(j-c)1} = 3^{\circ}\text{C/W (Typ.)}$$

b) Final stage transistor

$$R_{th(j-c)2} = 1.5^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 30\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.1\text{W}$, $\eta_T = 50\%$ (minimum rating), P_{O1} (Note 1) = 2W , $I_T = 4.8\text{A}$ (I_{T1} (2) = 0.4A , I_{T2} (3) = 4.4A)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)2} + T_c \quad (4) \\ &= (12.5 \times 0.4 - 2 + 0.1) \times 3 + T_c \\ &= 9.3 + T_c \quad (^{\circ}\text{C}) \end{aligned}$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_O + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 4.4 - 30 + 2) \times 1.5 + T_c \\ &= 40.5 + T_c \quad (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 30W below 90°C .

The thermal resistance $R_{th(c-a)}$ (5) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{in}} = \frac{90 - 60}{(30/0.5) - 30 + 0.1} \\ &= 1.00 \quad (^{\circ}\text{C/W}) \end{aligned}$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 110^{\circ}\text{C}, T_{j2} = 131^{\circ}\text{C at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 70^{\circ}\text{C}, T_{j2} = 101^{\circ}\text{C}$$

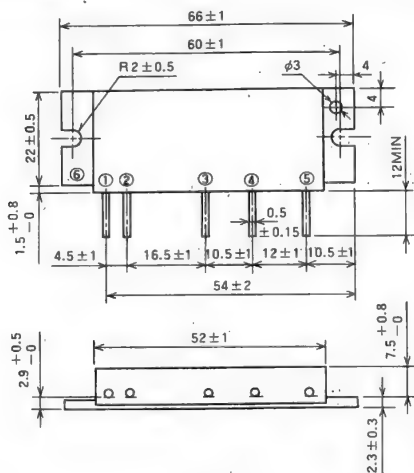
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

M57729EL

335~360MHz, 12.5V, 30W, FM MOBILE RADIO

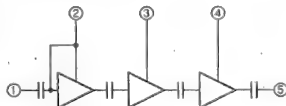
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

① Pin : RF INPUT

② Vcc1 : 1st. DC SUPPLY

③ Vcc2 : 2nd. DC SUPPLY

④ Vcc3 : 3rd. DC SUPPLY

⑤ Po : RF OUTPUT

⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

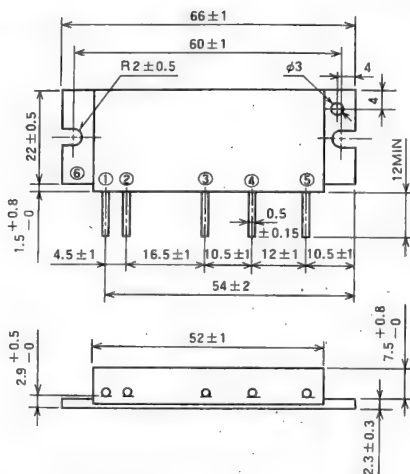
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		10	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.6	W
P _{O(max)}	Output power	Z _G = Z _L = 50 Ω	40	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		335	360	MHz
P _o	Output power	P _{in} = 0.3W	30		W
η _T	Total efficiency	V _{cc} = 12.5V	40		%
2f _o	2nd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 30W (P _{in} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

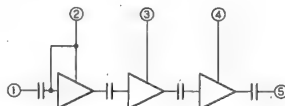
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②VCC1 : 1st. DC SUPPLY
③VCC2 : 2nd. DC SUPPLY
④VCC3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Rating	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		10	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.6	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	40	W
T _{c(op)}	Operation case temperature		− 30 ~ 110	°C
T _{stg}	Storage temperature		− 40 ~ 110	°C

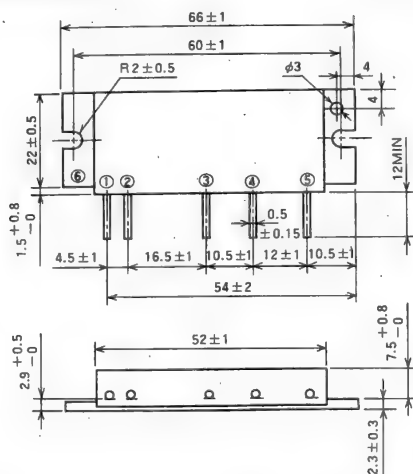
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.3W$ $V_{cc} = 12.5V$ $Z_0 = Z_L = 50 \Omega$	360	380	MHz
Po	Output power		30		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			- 30	dB
ρ_{in}	Input VSWR		2.8	-	
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 30W$ (P_{in} : controlled) Load VSWR=20:1 (All phses), 2sec. $Z_0 = 50 \Omega$	No degradation		-

M57729UL

380~400MHz, 12.5V, 30W, FM MOBILE RADIO

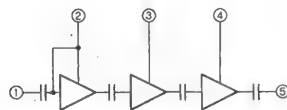
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN:

- ① P_{in} : RF INPUT
- ② V_{cc1} : 1st. DC SUPPLY
- ③ V_{cc2} : 2nd. DC SUPPLY
- ④ V_{cc3} : 3rd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

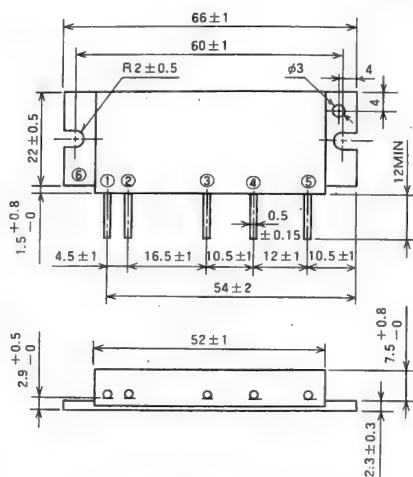
Symbol	Parameter	Conditions	Ratings	Unit
V_{cc}	Supply voltage		17	V
I_{cc}	Total current		10	A
$P_{in(max)}$	Input power	$Z_0 = Z_L = 50 \Omega$	0.6	W
$P_{o(max)}$	Output power	$Z_0 = Z_L = 50 \Omega$	40	W
$T_c(OP)$	Operation case temperature		-30~110	$^\circ\text{C}$
T_{stg}	Storage temperature		-40~110	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.3\text{W}$ $V_{cc} = 12.5\text{V}$ $Z_0 = Z_L = 50 \Omega$	380	400	MHz
P_o	Output power		30		W
η_T	Total efficiency		40		%
$2f_o$	2nd. harmonic			-30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{cc} = 15.2\text{V}$ $P_o = 30\text{W}$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50 \Omega$	No degradation		-

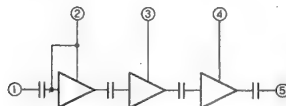
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

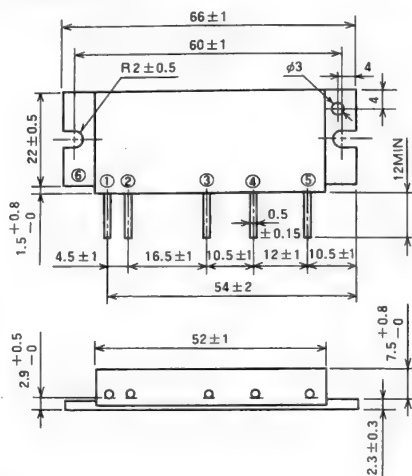
- ①Pin : RF INPUT
②VCC1 : 1st. DC SUPPLY
③VCC2 : 2nd. DC SUPPLY
④VCC3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		10	A
P _{IN(max)}	Input power	Z _G = Z _L = 50 Ω	0.6	W
P _{O(max)}	Output power	Z _G = Z _L = 50 Ω	40	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.3W$ $V_{cc} = 12.5V$ $Z_0 = Z_L = 50 \Omega$	400	420	MHz
Po	Output power		30		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			- 30	dB
ρ_{in}	Input VSWR		2.8	-	
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 30W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50 \Omega$	No degradation		-

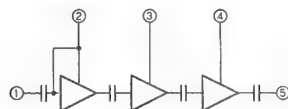
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

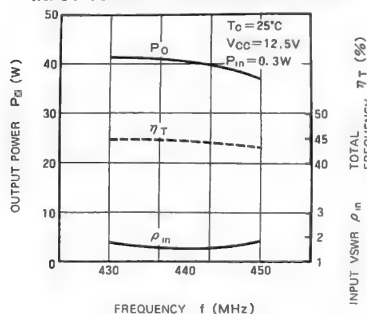
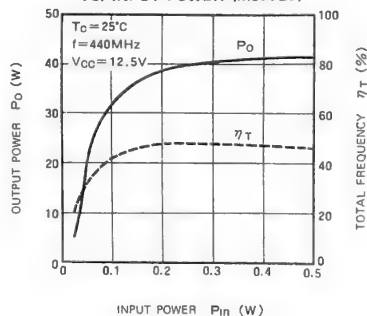
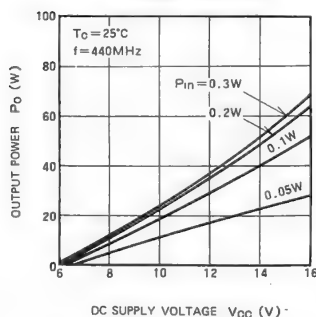
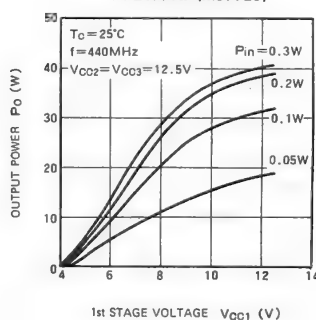
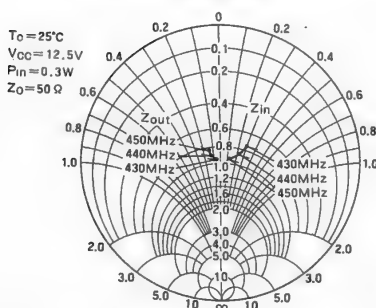
ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		10	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.6	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	40	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.3W Vcc = 12.5V Z ₀ = Z _L = 50 Ω	430	450	MHz
P _o	Output power		30		W
η _T	Total efficiency		40		%
2f ₀	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V, P _o = 30W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

430~450MHz, 12.5V, 30W, FM MOBILE RADIO

OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY (M57729)OUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWER (M57729)OUTPUT POWER VS. DC SUPPLY
VOLTAGE (M57729)OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57729)INPUT IMPEDANCE, OUTPUT
IMPEDANCE VS. FREQUENCY
(M57729)

DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 12^{\circ}\text{C/W (Typ.)}$$

- b) Second stage transistor

$$R_{th(j-c)2} = 4^{\circ}\text{C/W (Typ.)}$$

- c) Final stage transistor

$$R_{th(j-c)3} = 2^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 30\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{IN} = 0.3\text{W}$, $\eta_T = 40\%$ (minimum rating), P_{O1} (Note 1) = 2.0W , P_{O2} (2) = 8.0W , $I_T = 6.0\text{A}$ (I_{T1} (3) = 0.35A , I_{T2} (4) = 1.32A , I_{T3} (5) = 4.33A)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{IN}) \times R_{th(j-c)1} + T_C^{(6)} \\ &= (12.5 \times 0.35 - 2.0 + 0.3) \times 12 + T_C \\ &= 32 + T_C (^{\circ}\text{C}) \end{aligned}$$

Note 6: Package temperature of device

- Junction temperature of the second stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_C \\ &= (12.5 \times 1.32 - 8.0 + 2.0) \times 4 + T_C \\ &= 42 + T_C (^{\circ}\text{C}) \end{aligned}$$

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j3} &= (V_{CC} \times I_{T3} - P_O + P_{O2}) \times R_{th(j-c)3} + T_C \\ &= (12.5 \times 4.33 - 30 + 8) \times 2 + T_C \\ &= 64 + T_C (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 7W below 90°C .

The thermal resistance $R_{th(c-a)}^{(7)}$ of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{IN}} = \frac{90 - 60}{(30/0.4) - 30 + 0.3} \\ &= 0.66 (^{\circ}\text{C/W}) \end{aligned}$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$\begin{aligned} T_{j1} &= 122^{\circ}\text{C}, T_{j2} = 132^{\circ}\text{C}, T_{j3} = 155^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, \\ T_c &= 90^{\circ}\text{C}. \end{aligned}$$

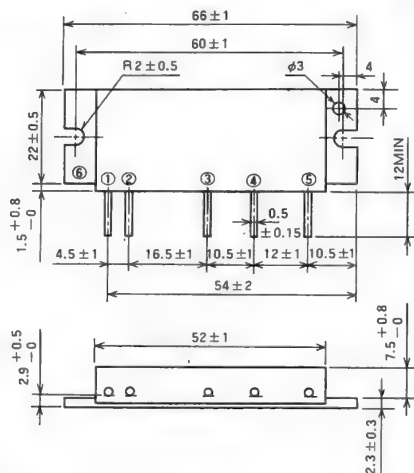
In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 92^{\circ}\text{C}, T_{j2} = 102^{\circ}\text{C}, T_{j3} = 125^{\circ}\text{C}.$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

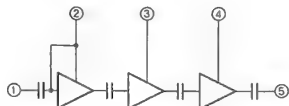
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

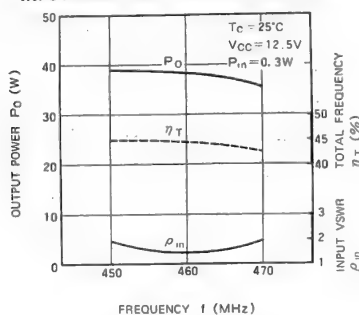
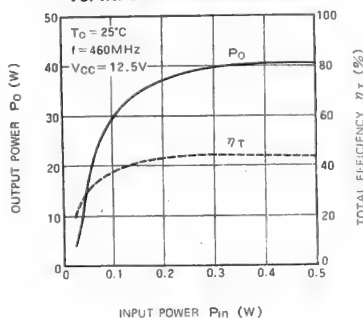
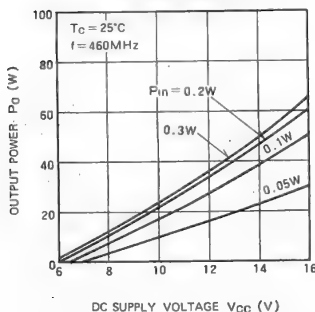
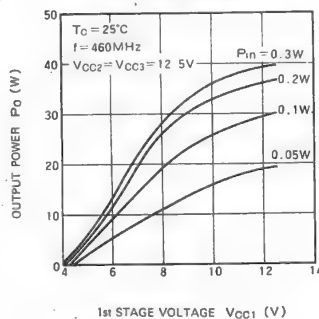
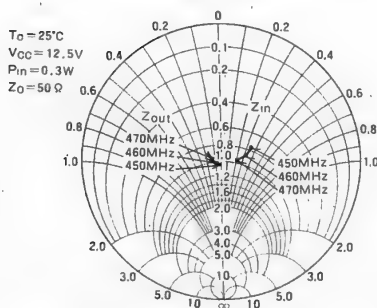
- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vcc2 : 2nd. DC SUPPLY
④Vcc3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Rating	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		10	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.6	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	40	W
T _{C(OP)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.3W$ $V_{cc} = 12.5V$ $Z_0 = Z_L = 50 \Omega$	450	470	MHz
Po	Output power		30		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 30W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50 \Omega$	No degradation		-

450~470MHz, 12.5V, 30W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

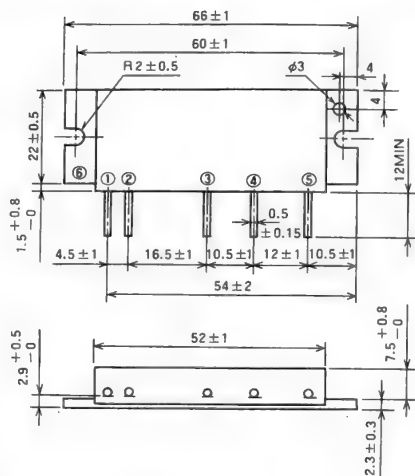
OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY (M57729H)OUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWER (M57729H)OUTPUT POWER VS. DC SUPPLY
VOLTAGE (M57729H)OUTPUT POWER VS. 1st STAGE
VOLTAGE (M57729H)OUTPUT IMPEDANCE, INPUT
IMPEDANCE VS. FREQUENCY
(M57729H)

M57729UH

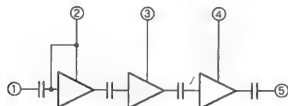
470~490MHz, 12.5V, 30W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

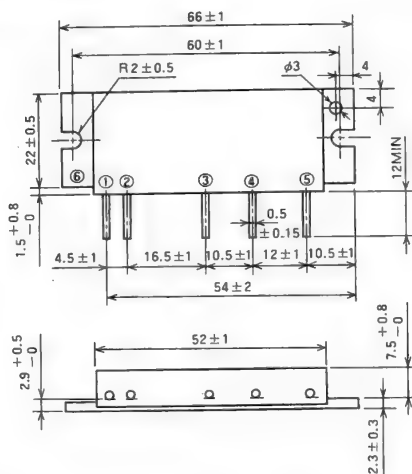
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		10	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.6	W
P _{O(max)}	Output power	Z _G = Z _L = 50 Ω	40	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.3W V _{cc} = 12.5V Z _G = Z _L = 50 Ω	470	490	MHz
P _o	Output power		30		W
η _T	Total efficiency		40		%
2f _o	2nd. harmonic			-30	dB
p _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 30W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

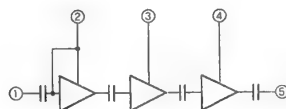
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

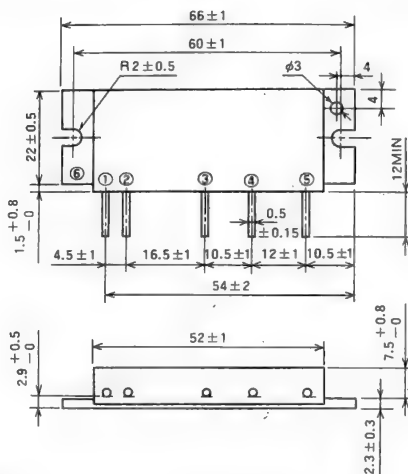
- ① Pin : RF INPUT
② Vcc1 : 1st. DC SUPPLY
③ Vcc2 : 2nd. DC SUPPLY
④ Vcc3 : 3rd. DC SUPPLY
⑤ Po : RF OUTPUT
⑥ GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		10	A
P _{in(max)}	Input power	Z _Θ = Z _L = 50 Ω	0.6	W
P _{O(max)}	Output power	Z _Θ = Z _L = 50 Ω	40	W
T _{C(OP)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.3W V _{cc} = 12.5V Z ₀ = Z _L = 50 Ω	490	512	MHz
P _o	Output power		30		W
η _T	Total efficiency		40		%
2f ₀	2nd. harmonic			- 30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 30W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

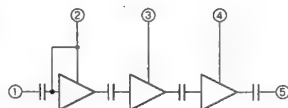
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		8	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.5	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	35	W
T _{c(op)}	Operation case temperature		-30~110	$^\circ\text{C}$
T _{stg}	Storage temperature		-40~110	$^\circ\text{C}$

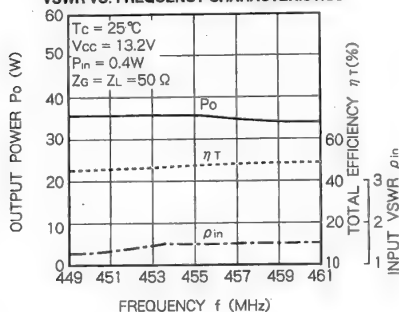
ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		453	457.5	MHz
P _o	Output power	P _{in} = 0.4W	30		W
η_T	Total efficiency	Vcc = 13.2V	35		%
2f ₀	2nd. harmonic	Z ₀ = Z _L = 50 Ω		-30	dB
ρ_{in}	Input VSWR			2	-
-	Load VSWR tolerance	Vcc = 15.2V, P _o = 28W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

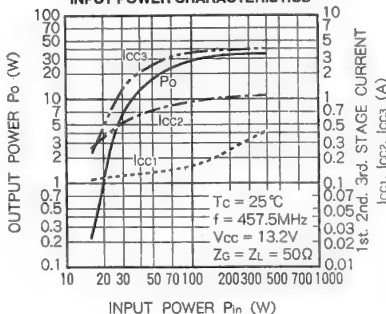
453~457.5MHz, 12.5V, 30W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

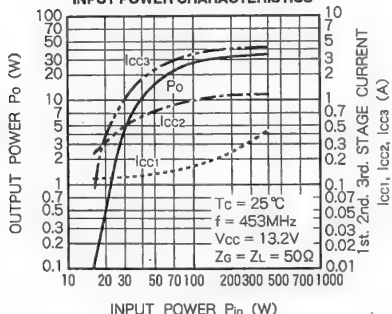
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



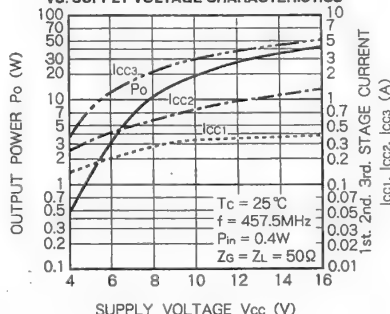
OUTPUT POWER, EACH STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



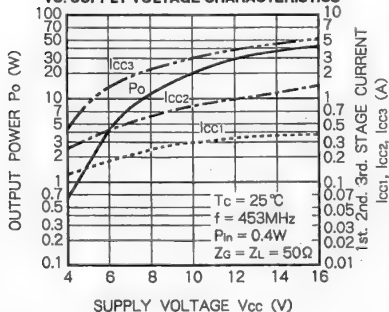
OUTPUT POWER, EACH STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



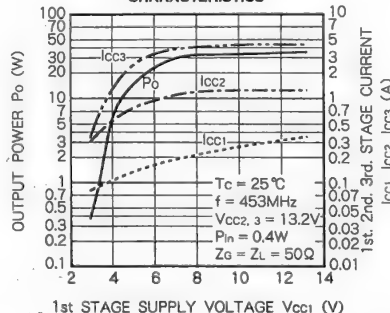
OUTPUT POWER, EACH STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

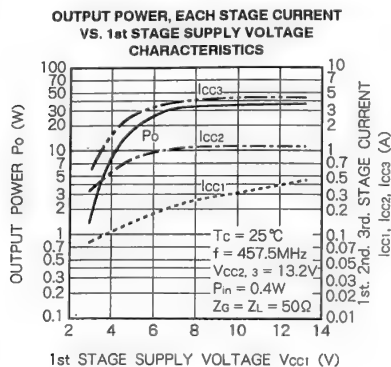


OUTPUT POWER, EACH STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS



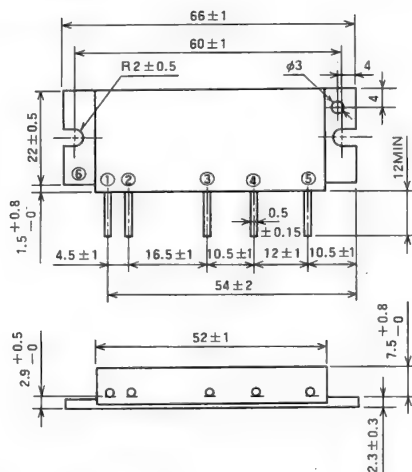
OUTPUT POWER, EACH STAGE CURRENT VS. 1st STAGE SUPPLY VOLTAGE CHARACTERISTICS





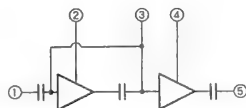
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③VBB : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

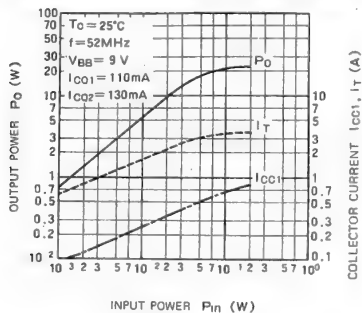
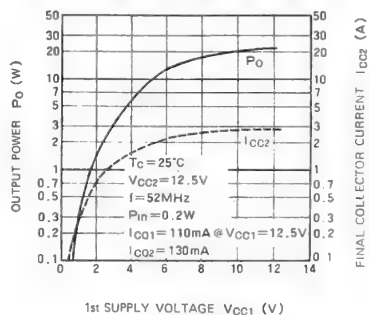
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Vbb	Base bias		10	V
Icc	Total current		6	A
P _{in(max)}	Input power	Z _g = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z _g = Z _L = 50 Ω	25	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

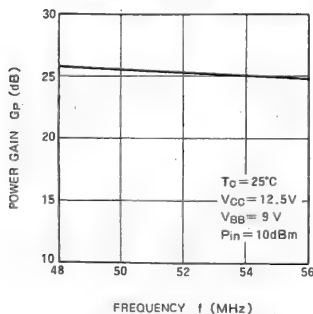
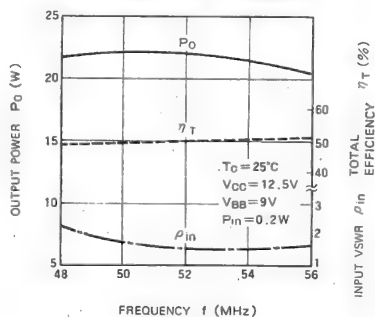
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		50	54	MHz
P _o	Output power	P _{in} = 0.2W	19		W
η _T	Total efficiency	Vcc = 12.5V	40		%
2f _o	2nd. harmonic	Vbb = 9V		-25	dB
3f _o	3rd. harmonic	Z _g = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.2	-
-	Load VSWR tolerance	Vcc = 15.2V, Vbb = 9V P _o = 14W (P _{in} : controlled) Load VSWR ≥ 20:1 (All phase) Z _g = 50 Ω	No degradation		-

50~54MHz, 12.5V, 19W, SSB MOBILE RADIO

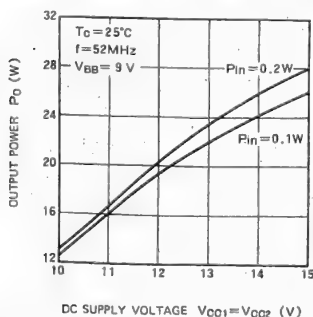
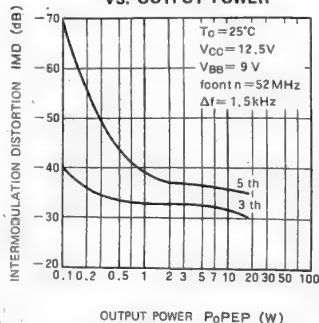
TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL COLLECTOR CURRENT
1st COLLECTOR CURRENT VS. INPUT POWEROUTPUT POWER, FINAL COLLECTOR
CURRENT VS. 1st STAGE VOLTAGE

POWER GAIN VS. FREQUENCY

OUTPUT POWER, TOTAL EFFICIENCY
INPUT VSWR VS. FREQUENCY

OUTPUT POWER VS. DC SUPPLY VOLTAGE

INTERMODULATION DISTORTION
VS. OUTPUT POWER

DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 10^{\circ}\text{C/W (Typ.)}$$

- b) Final stage transistor

$$R_{th(j-c)2} = 2^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_o = 14\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.07\text{W}$, $\eta_T = 40\%$ (minimum rating), P_{o1} (Note 1) = 2.5W , $I_T = 2.8\text{A}$ (I_{T1} (2) = 0.5A , I_{T2} (3) = 2.3A)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{o1} + P_{in}) \times R_{th(j-c)1} + T_c^{(4)} \\ &= (12.5 \times 0.5 - 2.5 + 0.07) \times 10 + T_c \\ &= 39 + T_c (^{\circ}\text{C}) \end{aligned}$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_o + P_{o1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 2.3 - 14 + 2.5) \times 2 + T_c \\ &= 35 + T_c (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 14W below 90°C .

The thermal resistance $R_{th(c-a)}^{(5)}$ of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_o/\eta_T) - P_o + P_{in}} = \frac{90 - 60}{(14/0.4) - 14 + 0.07} \\ &= 1.42 (^{\circ}\text{C/W}) \end{aligned}$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 129^{\circ}\text{C}, T_{j2} = 125^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

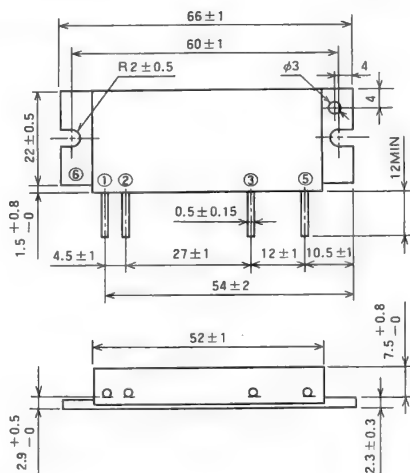
In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 99^{\circ}\text{C}, T_{j2} = 95^{\circ}\text{C}$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

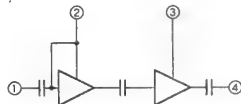
OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



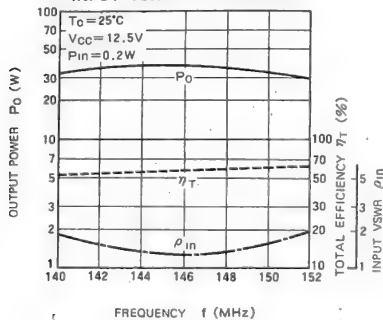
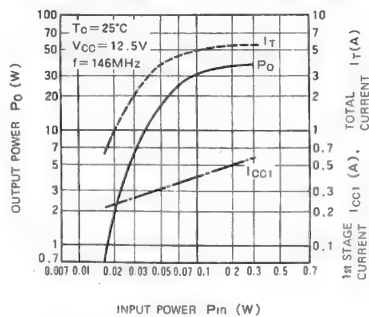
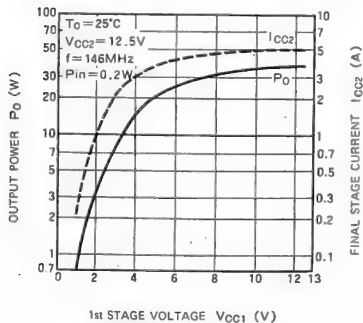
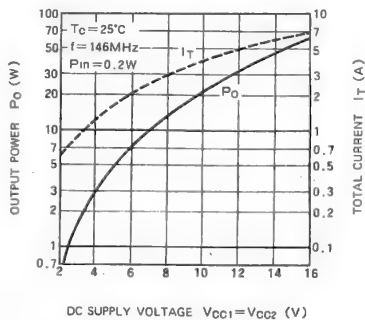
①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vcc2 : 2nd. DC SUPPLY
④Po : RF OUTPUT
⑤GND : FIN

Symbol	Parameter	Conditions	Rating	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		7	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	40	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~+110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.2W$ $V_{cc} = 12.5V$ $Z_G = Z_L = 50 \Omega$	144	148	MHz
Po	Output power		30		W
η_T	Total efficiency		45		%
2fo	2nd. harmonic			- 25	dB
3fo	3rd. harmonic			- 30	dB
ρ_{in}	Input VSWR		2.8	-	
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 35W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 5sec. $Z_G = 50\Omega$	No degradation		-

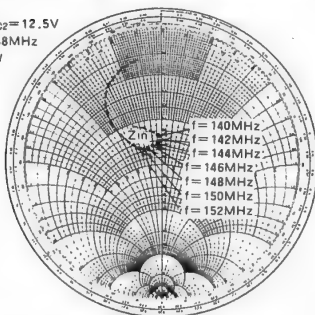
144~148MHz, 12.5V, 30W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCYOUTPUT POWER, 1st STAGE CURRENT,
TOTAL CURRENT VS. INPUT POWEROUTPUT POWER, FINAL STAGE
CURRENT VS. 1st STAGE VOLTAGEOUTPUT POWER, TOTAL CURRENT
VS. DC SUPPLY VOLTAGE

INPUT IMPEDANCE VS. FREQUENCY

$T_o = 25^\circ\text{C}$
 $V_{CC1} = V_{CC2} = 12.5\text{V}$
 $f = 144 \sim 148\text{MHz}$
 $P_{in} = 0.2\text{W}$
 $Z_o = 50\Omega$



DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 8^{\circ}\text{C/W (Typ.)}$$

- b) Second stage transistor

$$R_{th(j-c)2} = 2^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 28\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.2\text{W}$, $\eta_T = 45\%$ (minimum rating), $P_{O1}(\text{Note 1}) = 5\text{W}$, $I_T = 5.0\text{A}$ ($I_{T1}^{(2)} = 0.9\text{A}$, $I_{T2}^{(3)} = 4.1\text{A}$)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_c^{(4)} \\ &= (12.5 \times 0.9 - 5 + 0.2) \times 8 + T_c \\ &= 52 + T_c (^{\circ}\text{C}) \end{aligned}$$

Note 4: Package temperature of device

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_O + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 4.1 - 28 + 5) \times 2 + T_c \\ &= 57 + T_c (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design;

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 28W below 90°C .

The thermal resistance $R_{th(c-a)}^{(5)}$ of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{in}} = \frac{90 - 60}{(28/0.45) - 28 + 0.2} \\ &= 0.87 (^{\circ}\text{C/W}) \end{aligned}$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 142^{\circ}\text{C}, T_{j2} = 147^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 112^{\circ}\text{C}, T_{j2} = 118^{\circ}\text{C}$$

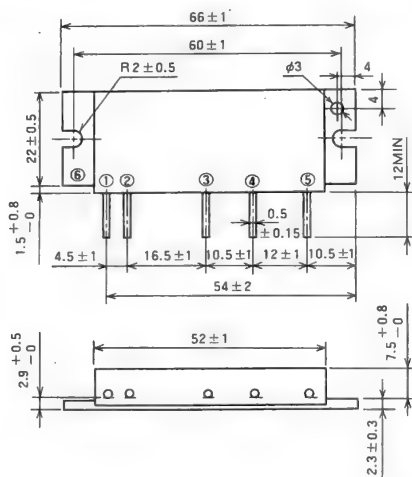
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

①Pin : RF INPUT
②VCC1 : 1st. DC SUPPLY
③VCC2 : 2nd. DC SUPPLY
④Po : RF OUTPUT
⑤GND : FIN

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$V_{CC1} = V_{CC2} = 12.5V$ $P_{in} = 30mW$ $Z_0 = Z_L = 50 \Omega$	824	849	MHz
Po	Output power		6		W
η_T	Total efficiency		35		%
2fo, 3fo	2nd, 3rd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	$V_{CC1} = V_{CC2} = 15.2V$ $P_o = 6W$ (P_{in} : controlled), $Z_0 = 50\Omega$ Load VSWR=20:1 (All phase), 5sec.	No degradation		-

OUTLINE DRAWING

Dimensions in mm



H3

PIN :

① Pin : RF INPUT

② Vcc1 : 1st. DC SUPPLY

③ Vcc2 : 2nd. DC SUPPLY

④ Vcc3 : 3rd. DC SUPPLY

⑤ Po : RF OUTPUT

⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

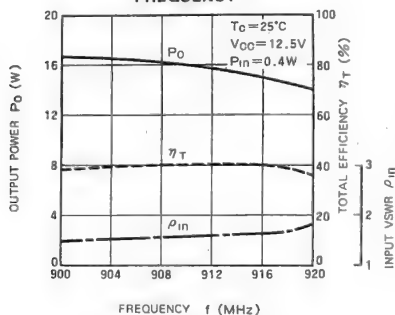
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, V _{cc1} ≤ 12.5V	0.6	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	18	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

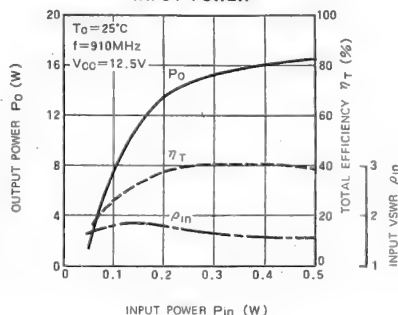
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	V _{cc1} = V _{cc2} = V _{cc3} = 12.5V P _{in} = 0.4W Z _G = Z _L = 50 Ω	889	915	MHz
P _o	Output power		13		W
η _T	Total efficiency		30		%
2f _o	2nd. harmonic			-25	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{cc1} = V _{cc2} = V _{cc3} = 15.2V P _o = 14W (P _{in} : controlled) Load VSWR = 20:1 (All phase), 2sec.	No degradation		-

TYPICAL CHARACTERISTICS

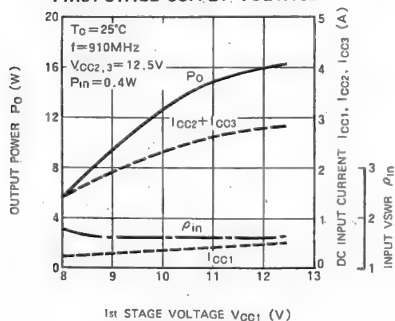
OUTPUT POWER, TOTAL
EFFICIENCY, INPUT VSWR VS.
FREQUENCY



OUTPUT POWER, TOTAL
EFFICIENCY, INPUT VSWR VS.
INPUT POWER



OUTPUT POWER, EACH STAGE
DC CURRENT, INPUT VSWR VS.
FIRST-STAGE SUPPLY VOLTAGE



DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 15^{\circ}\text{C/W (Typ.)}$$

- b) Second stage transistor

$$R_{th(j-c)2} = 6^{\circ}\text{C/W (Typ.)}$$

- c) Final stage transistor

$$R_{th(j-c)3} = 2.5^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 13\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.4\text{W}$, $\eta_T = 35\%$ (minimum rating), P_{O1} (Note 1) = 1.6W , P_{O2} (2) = 6W , $I_T = 3.0\text{A}$ (I_{T1} (3) = 0.25A , I_{T2} (4) = 0.75A , I_{T3} (5) = 2A)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_c^{(6)} \\ &= (12.5 \times 0.25 - 1.6 + 0.4) \times 15 + T_c \\ &= 29 + T_c (^{\circ}\text{C}) \end{aligned}$$

Note 6: Package temperature of device

- Junction temperature of the second stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 0.75 - 6 + 1.6) \times 6 + T_c \\ &= 29.9 + T_c (^{\circ}\text{C}) \end{aligned}$$

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j3} &= (V_{CC} \times I_{T3} - P_O + P_{O2}) \times R_{th(j-c)3} + T_c \\ &= (12.5 \times 2 - 13 + 6) \times 2.5 + T_c \\ &= 45 + T_c (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 13W below 90°C .

The thermal resistance $R_{th(c-a)}^{(7)}$ of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{in}} = \frac{90 - 60}{(13/0.35) - 13 + 0.4} \\ &= 1.2 (^{\circ}\text{C/W}) \end{aligned}$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 119^{\circ}\text{C}, T_{j2} = 120^{\circ}\text{C}, T_{j3} = 135^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

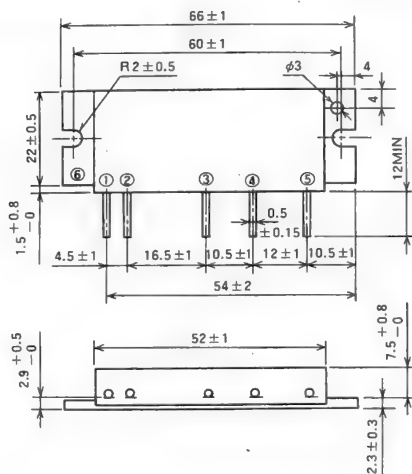
In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 89^{\circ}\text{C}, T_{j2} = 90^{\circ}\text{C}, T_{j3} = 105^{\circ}\text{C}.$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

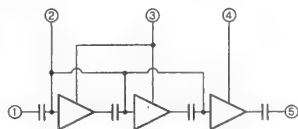
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② V_{BB} : BASE BIAS
- ③ V_{CC1} : 1st. DC SUPPLY
- ④ V_{CC2} : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

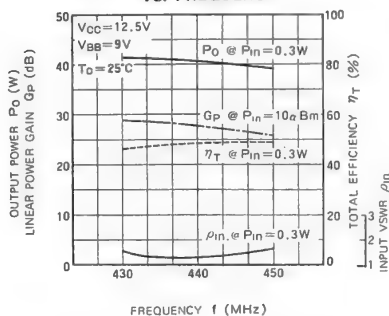
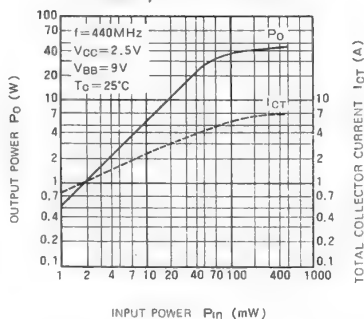
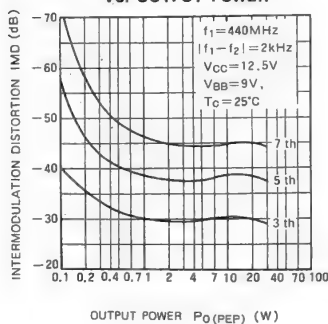
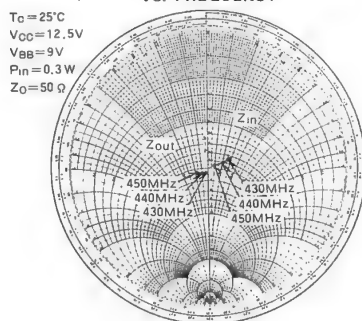
ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
V _{BB}			10	V
I _{CC}	Total current		10	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.5	W
P _{O(max)}	Output power	Z _G = Z _L = 50 Ω	40	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.3W V _{CC} = 12.5V V _{BB} = 9V Z _G = Z _L = 50 Ω	430	450	MHz
P _O	Output power		33		W
η _T	Total efficiency		40		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{CC} = 15.2V, V _{BB} = 9V P _O = 30W (P _{in} : controlled) Load VSWR=8:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

TYPICAL PERFORMANCE DATA

OUTPUT POWER, LINEAR POWER GAIN,
TOTAL EFFICIENCY, INPUT VSWR
VS. FREQUENCYOUTPUT POWER, TOTAL COLLECTOR
CURRENT, VS. INPUT POWERINTERMODULATION DISTORTION
VS. OUTPUT POWERINPUT IMPEDANCE, OUTPUT IMPEDANCE
VS. FREQUENCY

DESIGN CONSIDERATION OF HEAT RADIATION.

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 12^{\circ}\text{C/W (Typ.)}$$

- b) Second stage transistor

$$R_{th(j-c)2} = 4^{\circ}\text{C/W (Typ.)}$$

- c) Final stage transistor

$$R_{th(j-c)3} = 1.75^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 30\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{IN} = 0.3\text{W}$, $\eta_T = 40\%$ (minimum rating), P_{O1} (Note 1) = 2W , P_{O2} (2) = 8W , $I_T = 6\text{A}$ (I_{T1} (3) = 0.35A , I_{T2} (4) = 1.32A , I_{T3} (5) = 4.33A)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{IN}) \times R_{th(j-c)1} + T_c^{(6)} \\ &= (12.5 \times 0.35 - 2 + 0.3) \times 12 + T_c \\ &= 32 + T_c (^{\circ}\text{C}) \end{aligned}$$

Note 6: Package temperature of device

- Junction temperature of the second stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 1.32 - 8 + 2) \times 4 + T_c \\ &= 42 + T_c (^{\circ}\text{C}) \end{aligned}$$

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j3} &= (V_{CC} \times I_{T3} - P_O + P_{O2}) \times R_{th(j-c)3} + T_c \\ &= (12.5 \times 4.33 - 30 + 8) \times 1.75 + T_c \\ &= 56 + T_c (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 30W below 90°C .

The thermal resistance $R_{th(c-a)}$ (7) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{IN}} = \frac{90 - 60}{(30/0.4) - 30 + 0.3} \\ &= 0.66 (^{\circ}\text{C/W}) \end{aligned}$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink.

Mounting the heat sink of the above thermal resistance on the device,

$$\begin{aligned} T_{j1} &= 122^{\circ}\text{C}, T_{j2} = 132^{\circ}\text{C}, T_{j3} = 146^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, \\ T_c &= 90^{\circ}\text{C}. \end{aligned}$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 92^{\circ}\text{C}, T_{j2} = 102^{\circ}\text{C}, T_{j3} = 116^{\circ}\text{C}.$$

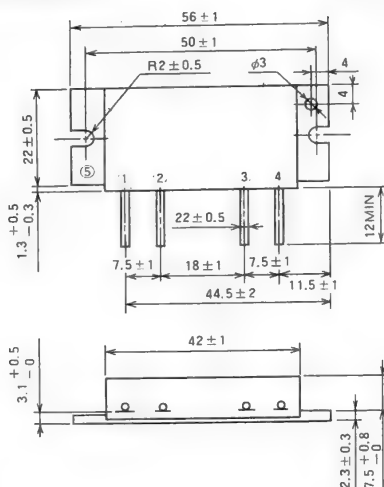
As the maximum junction temperature of these incorporated transistors $T_{j\text{max}}$ are 175°C , application under fully derated condition is ensured.

M57747

144~148MHz, 12.5V, 13W, FM MOBILE RADIO

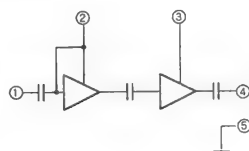
OUTLINE DRAWING

Dimensions in mm



H6

BLOCK DIAGRAM



PINNING :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : FINAL DC SUPPLY
- ④ Po : RF OUTPUT
- ⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		5	A
P _{in(max)}	Input power	V _{cc1} ≤ 12.5V, Z ₀ = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Same as above	20	W
T _{co(p)}	Operation case temperature	Same as above	- 30 ~ + 110	°C
T _{atg}	Storage temperature		- 40 ~ + 110	°C

Note : Above parameters are guaranteed independently.

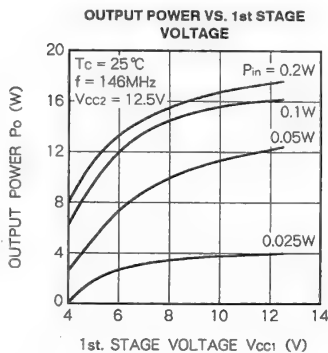
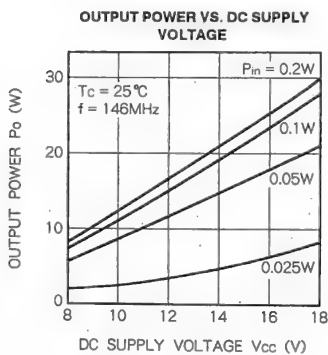
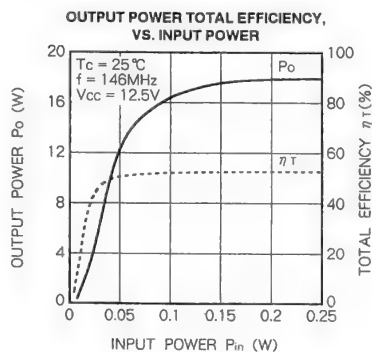
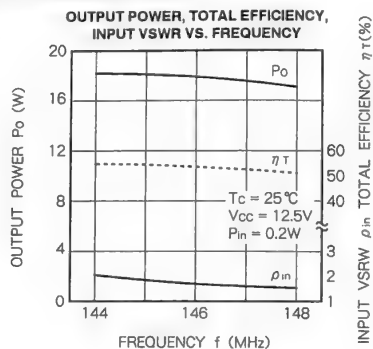
ELECTRICAL CHARACTERISTICS (T_C = 25 °C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		144	148	MHz
P _o	Output power		13		W
η _T	Total efficiency	P _{in} = 0.2W V _{cc} = 12.5V Z ₀ = Z _L = 50 Ω	48		%
2f ₀	2nd. harmonic			- 25	dB
3f ₀	3rd. harmonic			- 35	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V P _o = 14W (P _{in} : controlled) ρ _L = 20 : 1 (All phase) Z ₀ = 50 Ω	No degradation or destroy		-

Above parameters, ratings, limits and conditions are subject to change.

144~148MHz, 12.5V, 13W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA



DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$$R_{th(j-c)1} = 10^{\circ}\text{C/W(Typ.)}$$

b) Final stage transistor

$$R_{th(j-c)2} = 3^{\circ}\text{C/W(Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_o = 13\text{W}$, $V_{cc} = 12.5\text{V}$, $P_{in} = 0.2\text{W}$, $\eta_T = 48\%$ (minimum rating). $P_{o1}^{(Note1)} = 2.5\text{W}$, $I_T = 2.2\text{A}$ ($I_{T1}^{(2)} = 0.45\text{A}$, $I_{T2}^{(3)} = 1.75\text{A}$)

Note1: Output power of the first stage transistor

Note2: Circuit current of the first stage transistor

Note3: Circuit current of the first stage transistor

- Junction temperature of the first stage transistor

$$T_{j1} = (V_{cc} \times I_{T1} - P_{o1} + P_{in}) \times R_{th(j-c)1} + T_c^{(4)}$$

$$= (12.5 \times 0.45 - 2.5 + 0.2) \times 10 + T_c$$

$$= 33 + T_c(^{\circ}\text{C})$$

Note4: Package temperature of device

- Junction temperature of the final stage transistor

$$T_{j2} = (V_{cc} \times I_{T2} - P_o + P_{o1}) \times R_{th(j-c)2} + T_c$$

$$= (12.5 \times 1.75 - 13 + 2.5) \times 3 + T_c$$

$$= 34 + T_c(^{\circ}\text{C})$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 13W below 90°C .

The thermal resistance $R_{th(c-a)}^{(5)}$ of the heat sink to realize this:

$$R_{th(c-a)} = \frac{T_c - T_a}{(P_o / \eta_T) - P_o + P_{in}} = \frac{90 - 60}{(13 / 0.48) - 13 + 0.2} = 2.8(^{\circ}\text{C/W})$$

Note5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 113^{\circ}\text{C}, T_{j2} = 134^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C},$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 103^{\circ}\text{C}, T_{j2} = 104^{\circ}\text{C}$$

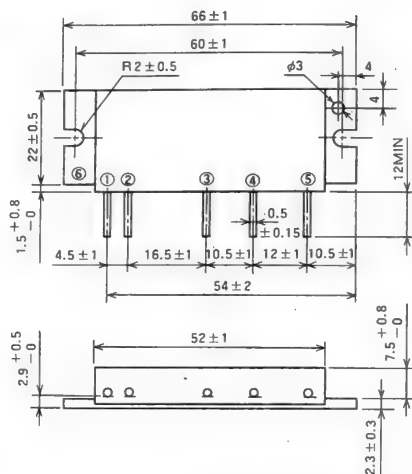
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

M57749

903~905MHz, 12.5V, 7W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



H3

PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

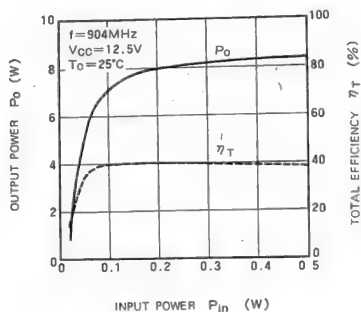
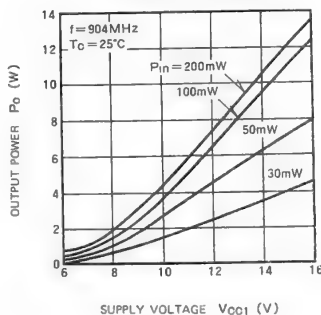
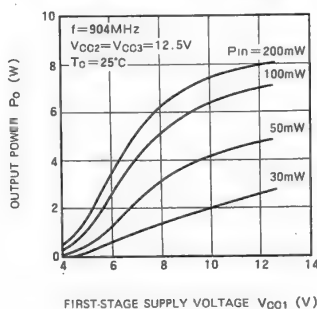
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		3	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, Vcc1 ≤ 12.5V	0.4	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
Tc(OP)	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = Vcc3 = 12.5V P _{in} = 0.2W Z _G = Z _L = 50 Ω	903	905	MHz
P _o	Output power		7		W
η _T	Total efficiency		30		%
2fo	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	Vcc1 = Vcc2 = Vcc3 = 15.2V P _o = 7W (P _{in} : controlled), Z _G = 50Ω Load VSWR=20:1 (All phase), 2sec.	No degradation		—

903~905MHz, 12.5V, 7W, FM MOBILE RADIO

TYPICAL CHARACTERISTICS

OUTPUT POWER, TOTAL
EFFICIENCY VS. INPUT POWEROUTPUT POWER VS.
SUPPLY VOLTAGEOUTPUT POWER VS.
FIRST-STAGE SUPPLY VOLTAGE

DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

- a) First stage transistor

$$R_{th(j-c)1} = 13^{\circ}\text{C/W (Typ.)}$$

- b) Second stage transistor

$$R_{th(j-c)2} = 9^{\circ}\text{C/W (Typ.)}$$

- c) Final stage transistor

$$R_{th(j-c)3} = 4^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

Conditions for standard operation.

$P_o = 7\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.2\text{W}$, $\eta_T = 30\%$ (minimum rating), P_{O1} (Note 1) = 1.5W , P_{O2} (2) = 3.6W , $I_T = 1.87\text{A}$ (I_{T1} (3) = 0.21A , I_{T2} (4) = 0.48A , I_{T3} (5) = 1.17A)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_c \text{ (6)} \\ &= (12.5 \times 0.21 - 1.5 + 0.2) \times 13 + T_c \\ &= 17 + T_c \text{ (}^{\circ}\text{C)} \end{aligned}$$

Note 6: Package temperature of device

Junction temperature of the second stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_c \\ &= (12.5 \times 0.48 - 3.6 + 1.5) \times 9 + T_c \\ &= 35 + T_c \text{ (}^{\circ}\text{C)} \end{aligned}$$

Junction temperature of the final stage transistor

$$\begin{aligned} T_{j3} &= (V_{CC} \times I_{T3} - P_o + P_{O2}) \times R_{th(j-c)3} + T_c \\ &= (12.5 \times 1.17 - 7 + 3.6) \times 4 + T_c \\ &= 45 + T_c \text{ (}^{\circ}\text{C)} \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 7W below 90°C .

The thermal resistance $R_{th(c-a)}$ (7) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_c - T_a}{(P_o/\eta_T) - P_o + P_{in}} = \frac{90 - 60}{(7/0.3) - 7 + 0.2} \\ &= 1.81 \text{ (}^{\circ}\text{C/W)} \end{aligned}$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 107^{\circ}\text{C}, T_{j2} = 125^{\circ}\text{C}, T_{j3} = 135^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_c = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 77^{\circ}\text{C}, T_{j2} = 95^{\circ}\text{C}, T_{j3} = 105^{\circ}\text{C}.$$

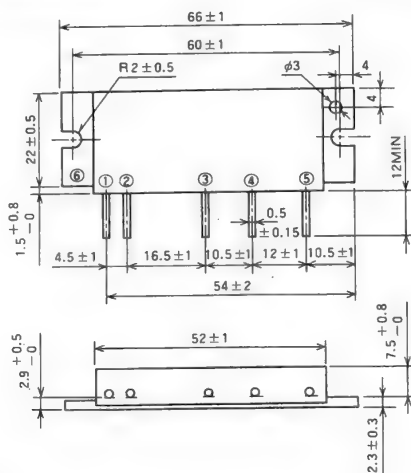
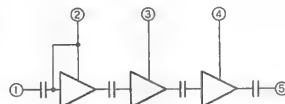
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

M57752

430~450MHz, 12.5V, 13W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm

**H3****BLOCK DIAGRAM**

PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

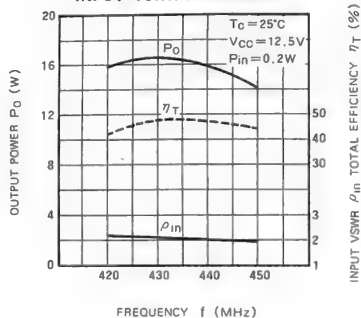
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.4	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

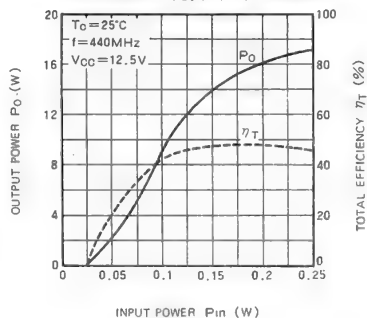
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		430	450	MHz
P _o	Output power	P _{in} = 0.2W	13		W
η _T	Total efficiency	Vcc = 12.5V	35		%
2f _o	2nd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V, P _o = 13W (P _{in} : controlled) Load VSWR=20:1(All phase), 2sec. Z _G = 50Ω	No degradation		-

TYPICAL PERFORMANCE DATA

OUTPUT POWER TOTAL EFFICIENCY
INPUT VSWR FREQUENCY

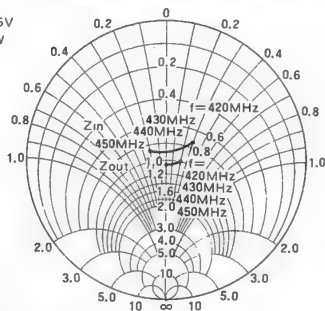


OUTPUT POWER TOTAL
EFFICIENCY VS. INPUT POWER

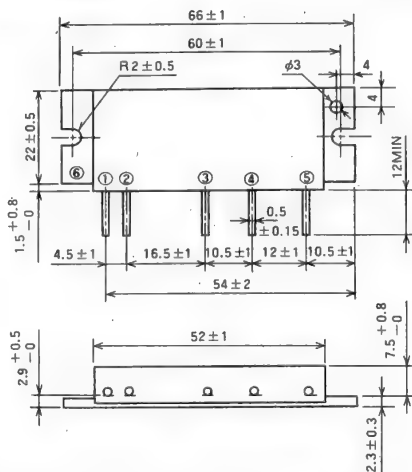


INPUT IMPEDANCE VS. FREQUENCY

$T_C = 25^\circ\text{C}$
 $V_{CC} = 12.5\text{V}$
 $P_{in} = 0.2\text{W}$
 $Z_0 = 50\ \Omega$



Dimensions in mm



H3

PIN :

① P_{in} : RF INPUT

② V_{CC1} : 1st DC SI

④ Vcc2 : 2nd DC SUPPLY

③ VCC2 : 2nd. DC SUPPLY

④VCC3 : 3rd. DC SUPPLY

⑤ Po : RF OUTPUT

⑥ GND ; FIN

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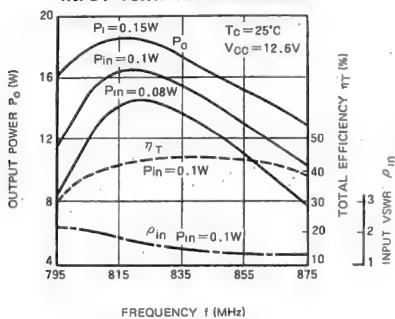
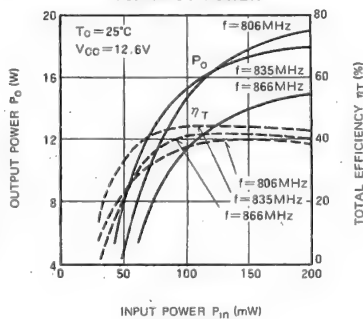
ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	1st. DC supply		14	V
Vcc2	2nd. DC supply		17	V
Vcc3	3rd. DC supply		17	V
Icc	Total current	$Z_G = Z_L = 50 \Omega$	7	A
P _{in(max)}	Input power	$Z_G = Z_L = 50 \Omega$, $V_{cc1} \leq 12.6V$	0.8	W
P _{o(max)}	Output power	$Z_G = Z_L = 50 \Omega$	30	W
T _{c(OP)}	Operation case temperature	$Z_G = Z_L = 50 \Omega$	-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

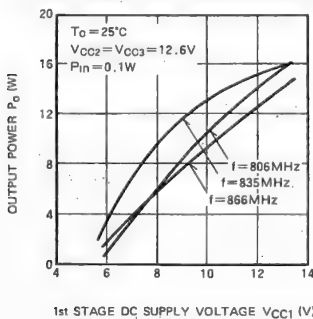
ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = Vcc3 = 12.6V P _{in} = 0.1W Z _G = Z _L = 50 Ω	806	866	MHz
P _o	Output power		10		W
η_T	Total efficiency		35		%
2f _o	2nd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc1 = Vcc2 = Vcc3 = 15.2V P _o = 10W (P _{in} : controlled), Z _G = 50Ω Load VSWR=20:1 (All phase), 5sec.	No degradation		-

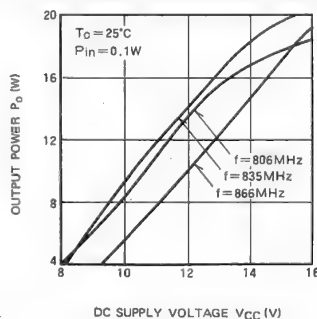
TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCYOUTPUT POWER, TOTAL EFFICIENCY,
VS. INPUT POWER

OUTPUT POWER VS. 1st STAGE VOLTAGE



OUTPUT POWER VS. DC SUPPLY VOLTAGE



DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$$R_{th(j-c)1} = 15^{\circ}\text{C/W (Typ.)}$$

b) Second stage transistor

$$R_{th(j-c)2} = 6.5^{\circ}\text{C/W (Typ.)}$$

c) Final stage transistor

$$R_{th(j-c)3} = 4^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

• Conditions for standard operation.

$P_O = 10\text{W}$, $V_{CC} = 12.6\text{V}$, $P_{in} = 0.1\text{W}$, $\eta_T = 35\%$ (minimum rating), P_{O1} (Note 1) = 1W, P_{O2} (2) = 4W, $I_T = 2.26\text{A}$ (I_{T1} (3) = 0.3A, I_{T2} (4) = 0.56A, I_{T3} (5) = 1.4A)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

• Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_C^{(6)} \\ &= (12.6 \times 0.3 - 1.0 + 0.1) \times 15 + T_C \\ &= 43.2 + T_C (^{\circ}\text{C}) \end{aligned}$$

Note 6: Package temperature of device

• Junction temperature of the second stage transistor

$$\begin{aligned} T_{j2} &= V_{CC} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_C \\ &= (12.6 \times 0.56 - 4 + 1.0) \times 6.5 + T_C \\ &= 26.4 + T_C (^{\circ}\text{C}) \end{aligned}$$

• Junction temperature of the final stage transistor

$$\begin{aligned} T_{j3} &= (V_{CC} \times I_{T3} - P_O + P_{O2}) \times R_{th(j-c)3} + T_C \\ &= (12.6 \times 1.4 - 10 + 4) \times 4 + T_C \\ &= 46.6 + T_C (^{\circ}\text{C}) \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 10W below 90°C .

The thermal resistance $R_{th(c-a)}$ (7) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_C - T_a}{(P_O/\eta_T) - P_O + P_{in}} = \frac{90 - 60}{(10/0.35) - 10 + 0.1} \\ &= 1.6 (^{\circ}\text{C/W}) \end{aligned}$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device;

$$T_{j1} = 133.2^{\circ}\text{C}, T_{j2} = 116.4^{\circ}\text{C}, T_{j3} = 136.6^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_C = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 103.2^{\circ}\text{C}, T_{j2} = 86.4^{\circ}\text{C}, T_{j3} = 106.6^{\circ}\text{C}.$$

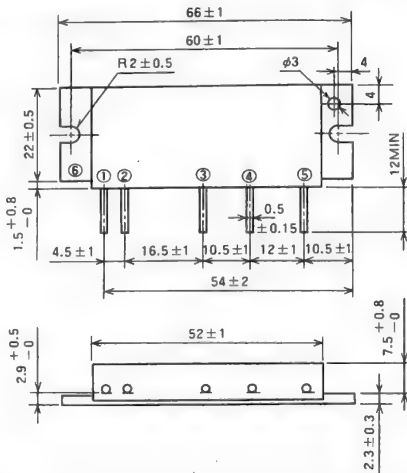
As the maximum junction temperature of these incorporated transistors $T_{j\text{max}}$ are 175°C , application under fully derated condition is ensured.

M57762

1.24~1.3GHz, 12.5V, 18W, SSB MOBILE RADIO

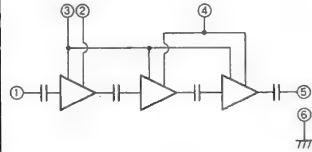
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN:

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS DC SUPPLY
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

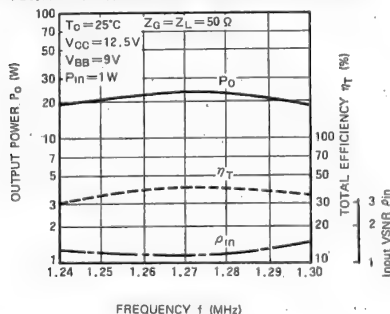
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
V _{BB}	Base bias voltage		10	V
I _{cc}	Total current		8	A
P _{in(max)}	Input power	V _{cc1} =12.5V, V _{BB} =9V, Z _G =Z _L =50Ω	2	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	25	W
T _{co(p)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise noted)

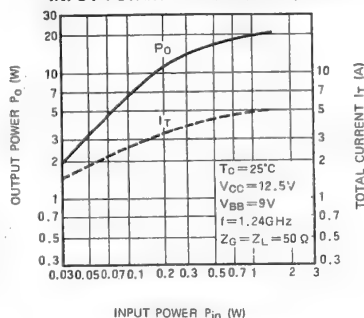
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	V _{cc1} = V _{cc2} = 12.5V V _{BB} = 9V P _{in} = 1W Z _G = Z _L = 50 Ω	1.24	1.3	GHz
P _o	Output power		18		W
η _T	Total efficiency		30		%
2f _o	2nd. harmonic			- 45	dB
ρ _{in}	Input VSWR			2.0	-
I _{BB}	Base bias current			500	mA
GP	Linear power gain	V _{cc1} = V _{cc2} = 12.5V, V _{BB} = 9V, P _{in} = 10dBm, Z _G = Z _L = 50Ω	13		dB
IMD ₃	3rd. intermodulation	V _{cc1} =V _{cc2} =12.5V, V _{BB} =9V, Δf=10kHz, P _{o(REF)} ≤ 14W, Z _G =Z _L =50Ω		- 24	dBc
IMD ₅	5th. intermodulation			- 31	dBc
-	Load VSWR tolerance	V _{cc1} =V _{cc2} =15.2V, V _{BB} =9V, P _o =18W (P _{in} :controlled), Z _o =50Ω Load VSWR=16:1 (All phase), 5sec.	No degradation		-

TYPICAL PERFORMANCE DATA

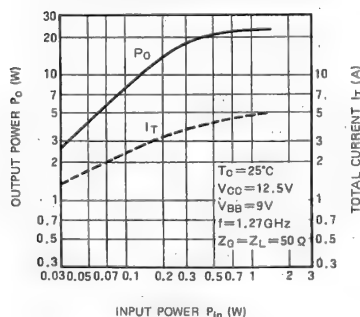
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



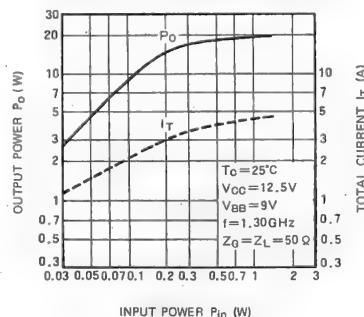
OUTPUT POWER, TOTAL CURRENT, VS. INPUT POWER CHARACTERISTICS



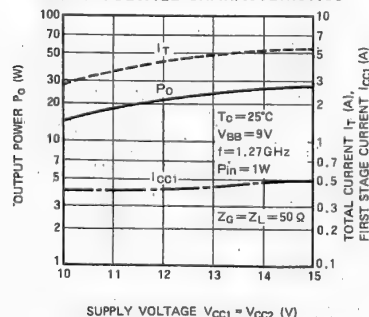
OUTPUT POWER, TOTAL CURRENT, VS. INPUT POWER CHARACTERISTICS



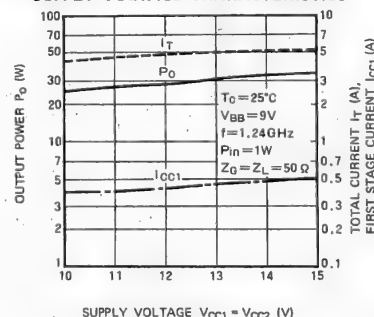
OUTPUT POWER, TOTAL CURRENT, VS. INPUT POWER CHARACTERISTICS



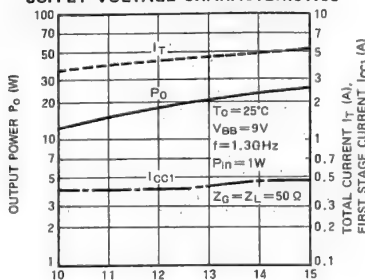
OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

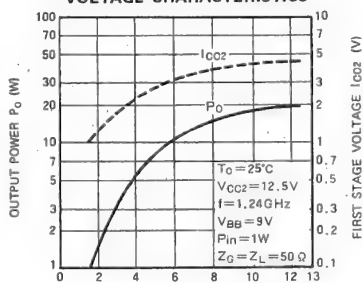


OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



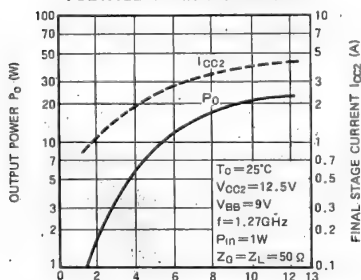
SUPPLY VOLTAGE $V_{cc1} = V_{cc2}$ (V)

OUTPUT POWER, FINAL STAGE
CURRENT VS. FIRST STAGE
VOLTAGE CHARACTERISTICS



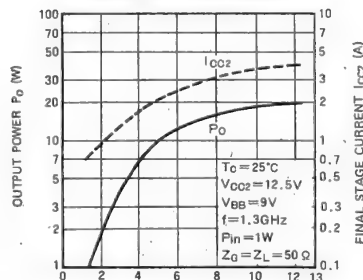
FIRST STAGE VOLTAGE V_{cc1} (V)

OUTPUT POWER, FINAL STAGE
CURRENT VS. FIRST STAGE
VOLTAGE CHARACTERISTICS



FIRST STAGE VOLTAGE V_{cc1} (V)

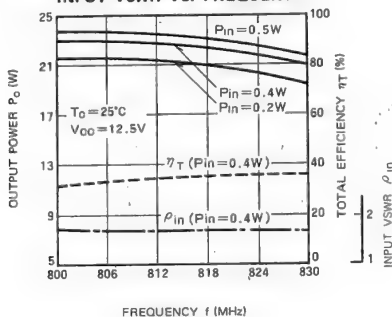
OUTPUT POWER, FINAL STAGE
CURRENT VS. FIRST STAGE
CURRENT CHARACTERISTICS



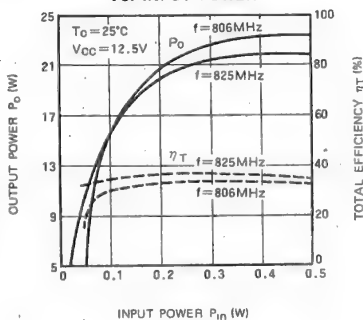
FIRST STAGE CURRENT I_{cc1} (A)

TYPICAL PERFORMANCE DATA

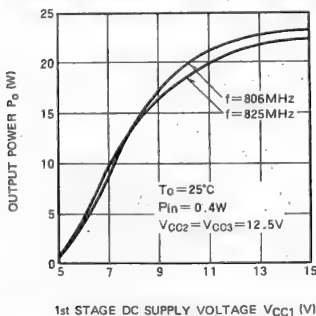
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY



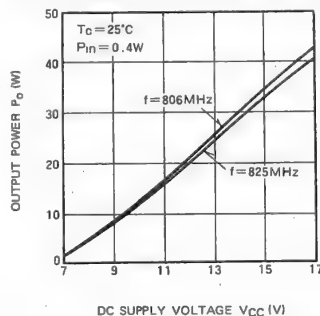
OUTPUT POWER, TOTAL EFFICIENCY, VS. INPUT POWER



OUTPUT POWER VS. 1st STAGE VOLTAGE



OUTPUT POWER VS. DC SUPPLY VOLTAGE



DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$$R_{th(j-c)1} = 15^{\circ}\text{C/W (Typ.)}$$

b) Second stage transistor

$$R_{th(j-c)2} = 5^{\circ}\text{C/W (Typ.)}$$

c) Final stage transistor

$$R_{th(j-c)3} = 1.87^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

- Conditions for standard operation.

$P_O = 20\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{In} = 0.4\text{W}$, $\eta_T = 30\%$ (minimum rating), P_{O1} (Note 1) = 3W , P_{O2} (2) = 10W , $I_T = 5.33\text{A}$ (I_{T1} (3) = 0.4A , I_{T2} (4) = 1.53A , I_{T3} (5) = 3.4A)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

- Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{In}) \times R_{th(j-c)1} + T_C^{(6)} \\ &= (12.5 \times 0.4 - 3 + 0.4) \times 15 + T_C \\ &= 36 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

Note 6: Package temperature of device

- Junction temperature of the second stage transistor

$$\begin{aligned} T_{j2} &= V_{CC} \times I_{T2} - P_{O2} + P_{O1} \times R_{th(j-c)2} + T_C \\ &= (12.5 \times 1.53 - 10 + 3) \times 5 + T_C \\ &= 60.6 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

- Junction temperature of the final stage transistor

$$\begin{aligned} T_{j3} &= (V_{CC} \times I_{T3} - P_O + P_{O2}) \times R_{th(j-c)3} + T_C \\ &= (12.5 \times 3.4 - 20 + 10) \times 1.87 + T_C \\ &= 60.8 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 20W below 90°C .

The thermal resistance $R_{th(c-a)}$ (7) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_C - T_a}{(P_O/\eta_T) - P_O + P_{In}} = \frac{90 - 60}{(20/0.3) - 20 + 0.4} \\ &= 0.637 \text{ (}^{\circ}\text{C/W)} \end{aligned}$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 126^{\circ}\text{C}, T_{j2} = 150.6^{\circ}\text{C}, T_{j3} = 150.8^{\circ}\text{C} \text{ at } T_a = 60^{\circ}\text{C}, T_C = 90^{\circ}\text{C}.$$

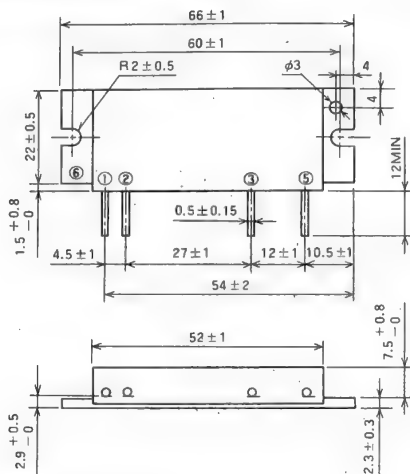
In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 96^{\circ}\text{C}, T_{j2} = 120.6^{\circ}\text{C}, T_{j3} = 120.8^{\circ}\text{C}.$$

As the maximum junction temperature of these incorporated transistors $T_{j\text{max}}$ are 175°C , application under fully derated condition is ensured.

OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



PIN :

① P_{in} : RF INPUT

②VCCI : 1st. DC SUPPLY

③ Vcc2 : 2nd. DC SUPPLY

④ P₀ : RF OUTPUT

⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		7	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.6	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	40	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

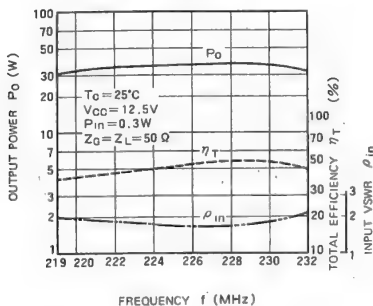
ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.3W$ $V_{cc} = 12.5V$ $Z_0 = Z_L = 50 \Omega$	220	225	MHz
Po	Output power		30		W
η_T	Total efficiency		43		%
2fo	2nd. harmonic			- 30	dB
3fo	3rd. harmonic			- 35	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 30W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 5sec. $Z_0 = 50\Omega$	No degradation		-

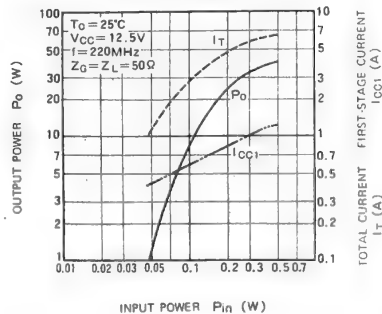
220~225MHz, 12.5V, 30W, FM MOBILE RADIO

TYPICAL CHARACTERISTICS

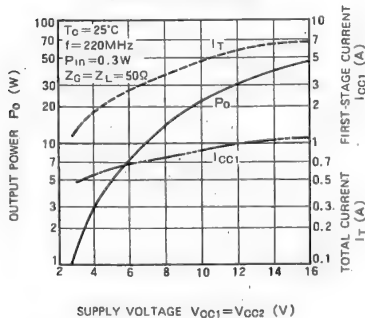
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY



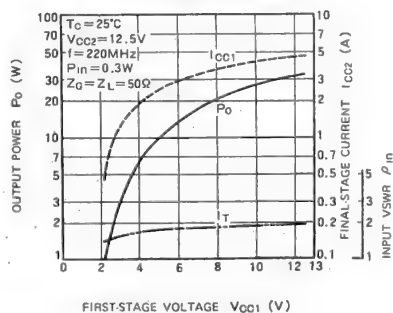
OUTPUT POWER, TOTAL CURRENT, FIRST-STAGE CURRENT VS. INPUT POWER



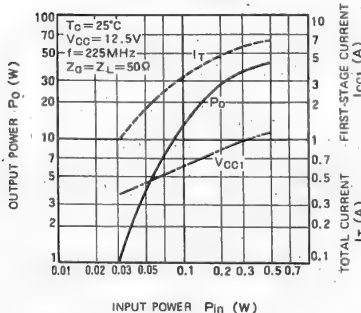
OUTPUT POWER, TOTAL CURRENT, FIRST-STAGE CURRENT VS. SUPPLY VOLTAGE



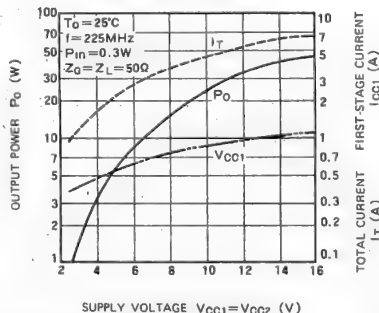
OUTPUT POWER, FINAL-STAGE CURRENT, INPUT VSWR VS. FIRST-STAGE VOLTAGE



OUTPUT POWER, TOTAL CURRENT, FIRST-STAGE CURRENT VS. INPUT POWER

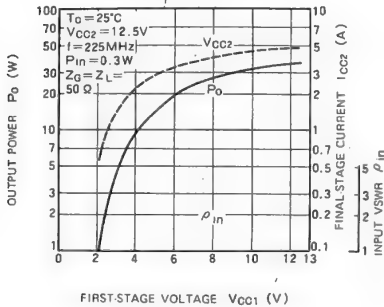


OUTPUT POWER, TOTAL CURRENT, FIRST-STAGE CURRENT VS. SUPPLY VOLTAGE

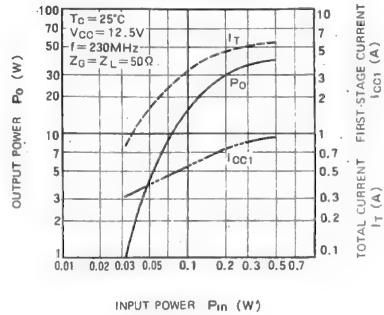


220~225MHz, 12.5V, 30W, FM MOBILE RADIO

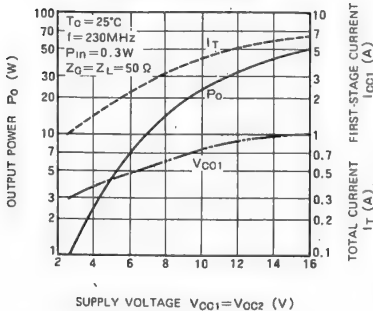
OUTPUT POWER, FINAL-STAGE
CURRENT, INPUT VSWR VS.
FIRST-STAGE VOLTAGE



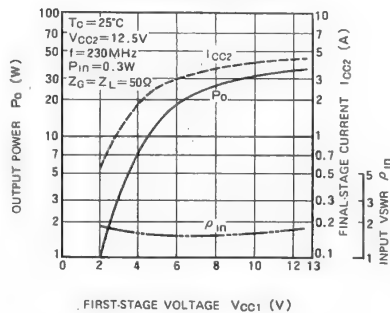
OUTPUT POWER, TOTAL CURRENT,
FIRST-STAGE CURRENT VS.
INPUT POWER



OUTPUT POWER, TOTAL CURRENT
FIRST-STAGE CURRENT VS.
SUPPLY VOLTAGE



OUTPUT POWER, FINAL-STAGE
CURRENT, INPUT VSWR VS.
FIRST-STAGE VOLTAGE



DESIGN CONSIDERATION OF HEAT RADIATION

Note the following when designing a heat sink:

1. Junction temperature of built-in transistor at standard operation

- (1) Thermal resistance between junction of built-in transistors and case

Thermal resistance between junction of 1st stage transistor and case

$$R_{th(j-c)1} = 8^{\circ}\text{C/W (typ.)}$$

Thermal resistance between junction of final stage transistor and case

$$R_{th(j-c)2} = 2^{\circ}\text{C/W}$$

- (2) Junction temperature of built-in transistor at standard operation

- Standard operating conditions

$P_O = 30\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{in} = 0.3\text{W}$, $\eta_T = 43\%$ (rated minimum), $P_{O1} = 5\text{W}$ (Note 1), $I_T = 5.6\text{A}$ (I_{T1} (Note 2) = 0.9A , I_{T2} (Note 3) = 4.7A)

Note 1: Output power of 1st stage transistor

Note 2: Current loss of 1st stage transistor

Note 3: Current loss of final stage transistor

- Junction temperature of 1st stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_C \text{ (Note 4)} \\ &= (12.5 \times 0.9 - 5 + 0.3) \times 8 + T_C \\ &= 52 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

Note 4: Case temperature of device

- Junction temperature of final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_O + P_{O1}) \times R_{th(j-c)2} + T_C \\ &= 912.5 \times 4.7 - 30 + 5 \times 2 + T_C \\ &= 68 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

2. Heat sink design

To design the thermal characteristics of a heat sink, keep the case temperature below 90°C when output power P_O is 28W and the upper limit of ambient temperature T_a is 60°C .

The thermal resistance $R_{th(c-a)}$ (Note 5) of a heat sink to achieve this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_C - T_a}{\frac{P_O}{\eta_T} - P_O + P_{in}} = \frac{90 - 60}{\frac{30}{0.43} - 30 + 0.3} \\ &= 0.75 \text{ (}^{\circ}\text{C/W)} \end{aligned}$$

Note 5: Including the contact thermal resistance between the device and the heat sink

Mounting the device on the heat sink with the above thermal resistance, junction temperatures of each transistor module becomes as follows:

$T_{j1} = 142^{\circ}\text{C}$, $T_{j2} = 158^{\circ}\text{C}$ at $T_a = 60^{\circ}\text{C}$, $T_C = 90^{\circ}\text{C}$,
Since the annual average of ambient temperature is 30°C ,
junction temperature of each transistor becomes as follows:
 $T_{j1} = 112^{\circ}\text{C}$ and $T_{j2} = 17^{\circ}\text{C}$.

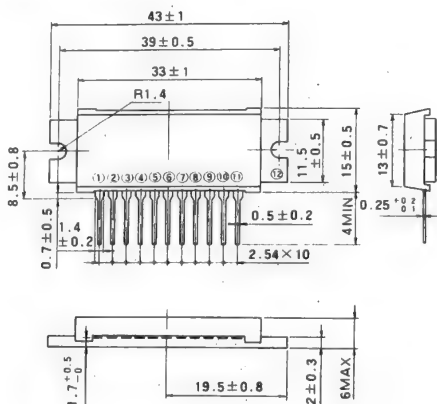
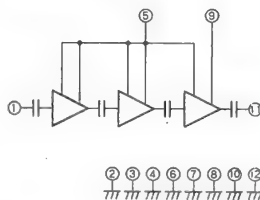
Use of these built-in transistors in temperatures below the maximum junction temperature T_{jmax} 175°C is guaranteed.

M57775

806~866MHz, 8V, 400mW, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm

**BLOCK DIAGRAM**

PIN :

- ①Pin : RF INPUT
- ⑤Vcc1 : 1st. DC SUPPLY
- ⑥Vcc2 : 2nd. DC SUPPLY
- ⑪Po : RF OUTPUT
- ②③④ GND
- ⑥⑦⑧ GND
- ⑨ GND
- ⑫ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

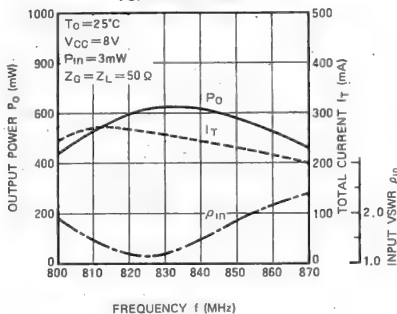
Symbol	Parameter	Conditions	Rating	Unit
V _{cc1}	1st. DC supply		11	V
V _{cc2}	2nd. DC supply		15	V
I _{cc}	Total current		0.6	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, V _{cc1} ≤ 8V	10	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	0.8	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

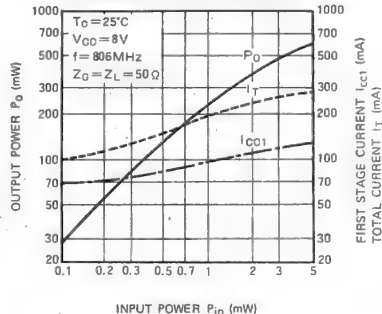
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	V _{cc1} = V _{cc2} = 8V	806	866	MHz
P _o	Output power	P _{in} = 3mW	400		
2f _o	2nd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			3.0	-
I _t	Total current	V _{cc1} = V _{cc2} = 8V, P _o = 0.4W (P _{in} : controlled) Z _G = Z _L = 50 Ω		290	mA
-	Load VSWR tolerance	V _{cc1} = 8V, V _{cc2} = 15V P _o = 0.4W (P _{in} : controlled), Z _G = 50 Ω Load VSWR = 20:1 (All phase), 5sec.	No degradation		-

TYPICAL CHARACTERISTICS

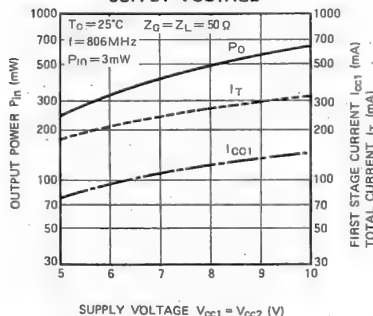
OUTPUT POWER,
TOTAL CURRENT, INPUT VSWR
VS. FREQUENCY



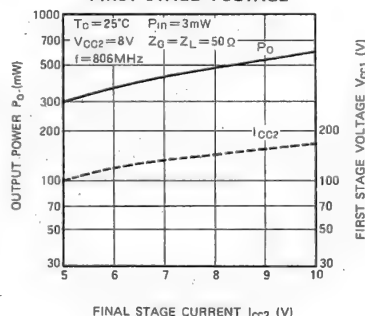
OUTPUT POWER,
TOTAL CURRENT, FIRST STAGE
CURRENT VS. INPUT POWER



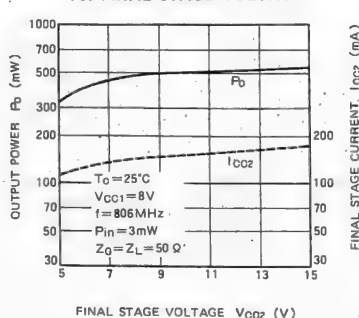
OUTPUT POWER,
TOTAL CURRENT VS.
SUPPLY VOLTAGE



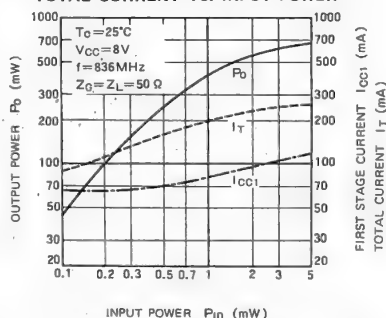
OUTPUT POWER,
FINAL STAGE CURRENT VS.
FIRST STAGE VOLTAGE



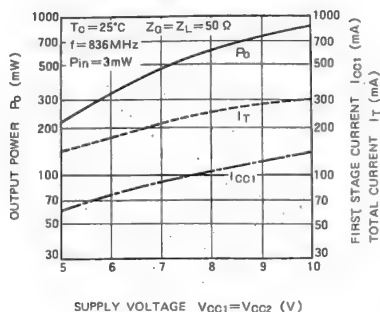
OUTPUT POWER, FINAL STAGE CURRENT
VS. FINAL STAGE VOLTAGE



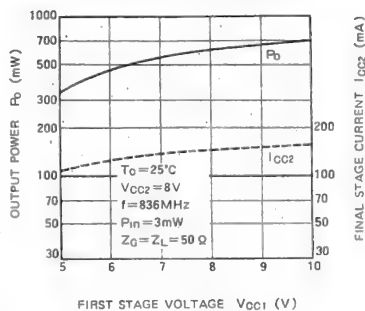
OUTPUT POWER, FIRST STAGE CURRENT
TOTAL CURRENT VS. INPUT POWER



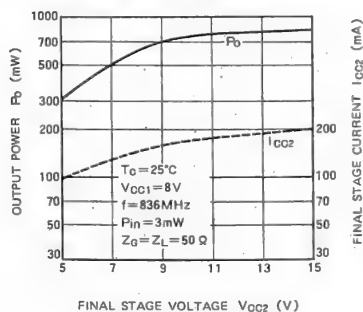
OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE



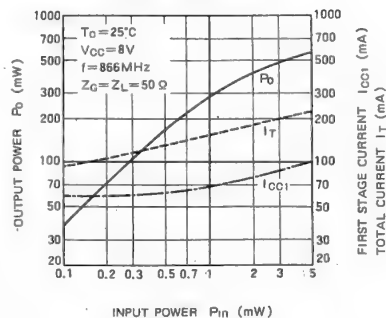
OUTPUT POWER, FINAL STAGE CURRENT
VS. FIRST STAGE VOLTAGE



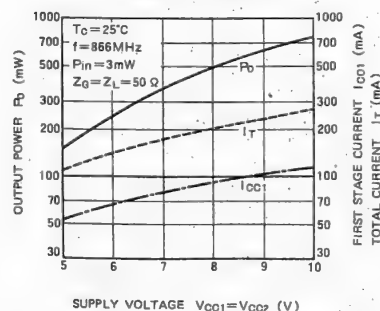
OUTPUT POWER, FINAL CURRENT
VS. FINAL VOLTAGE



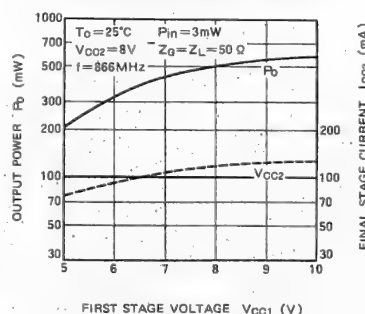
OUTPUT POWER, FIRST STAGE
CURRENT, TOTAL CURRENT
VS. INPUT POWER



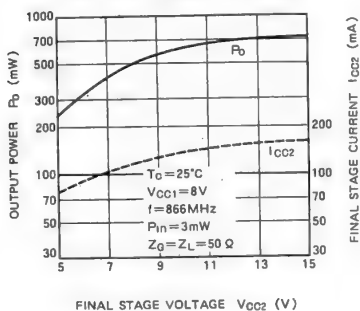
OUTPUT POWER, FIRST STAGE
CURRENT, FINAL STAGE CURRENT
VS. SUPPLY VOLTAGE



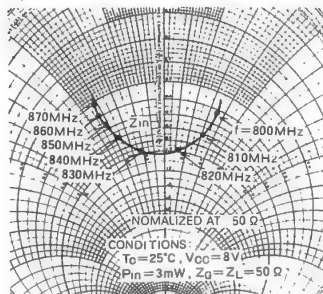
OUTPUT POWER, FINAL CURRENT
VS. FIRST STAGE VOLTAGE



806~866MHz, 8V, 400mW, FM MOBILE RADIO

OUTPUT POWER, FINAL STAGE CURRENT
VS. FINAL STAGE VOLTAGE

INPUT IMPEDANCE VS. FREQUENCY

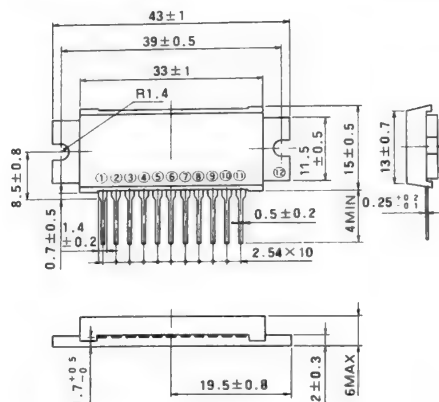


M57776

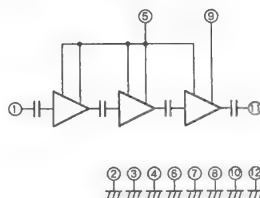
889~915MHz, 8V, 300mW, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



H8

BLOCK DIAGRAM

PIN :

- ① Pin : RF INPUT
- ⑤ Vcc1 : 1st. DC SUPPLY
- ⑨ Vcc2 : 2nd. DC SUPPLY
- ⑪ Po : RF OUTPUT
- ②③④ GND
- ⑥⑦⑧ GND
- ⑩ GND
- ⑫ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

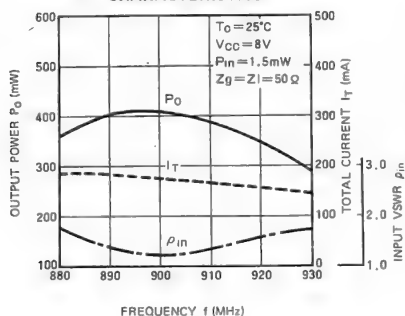
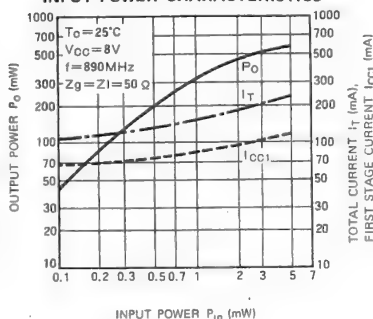
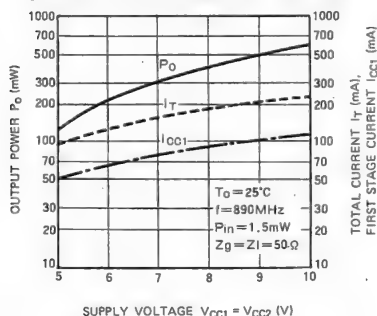
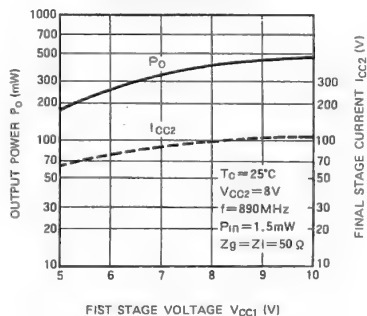
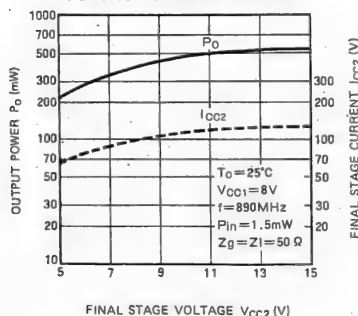
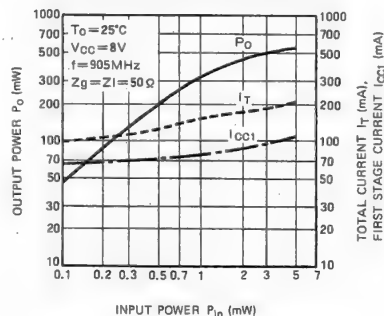
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	1st. DC supply		11	V
Vcc2	2nd. DC supply		15	V
Icc	Total current		0.6	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, Vcc1 ≤ 8V	5	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	0.6	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise noted)

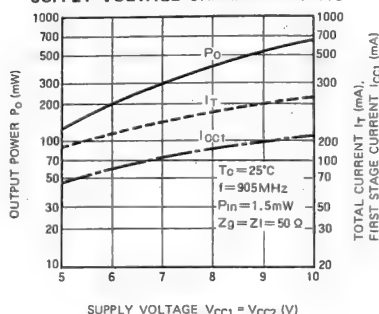
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = 8V P _{in} = 1.5mW Z _G = Z _L = 50 Ω	889	915	MHz
P _o	Output power		300		mW
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
I _r	Total current	Vcc1 = Vcc2 = 8V, P _o = 0.3W (P _{in} : controlled) Z _G = Z _L = 50 Ω		250	mA
-	Load VSWR tolerance	Vcc1 = 8V, Vcc2 = 15V P _o = 0.3W (P _{in} : controlled), Z _G = 50 Ω Load VSWR = 20:1 (All phase), 5sec.	No degradation		-

889-915MHz, 8V, 300mW, FM MOBILE RADIO

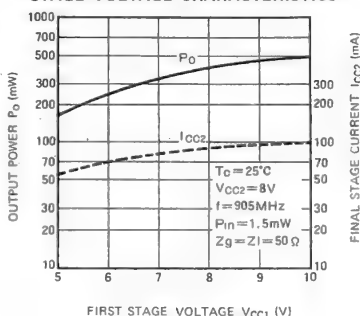
TYPICAL PERFORMANCE DATA /

OUTPUT POWER, TOTAL CURRENT,
INPUT VSWR VS. FREQUENCY
CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER, FINAL
CURRENT, VS. FIRST STAGE
CURRENT CHARACTERISTICSOUTPUT POWER, FINAL
CURRENT VS. FINAL STAGE
VOLTAGE CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICS

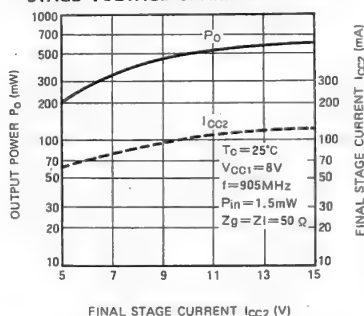
OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



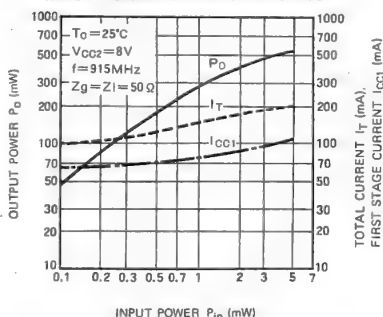
OUTPUT POWER, FINAL
STAGE CURRENT VS. FIRST
STAGE VOLTAGE CHARACTERISTICS



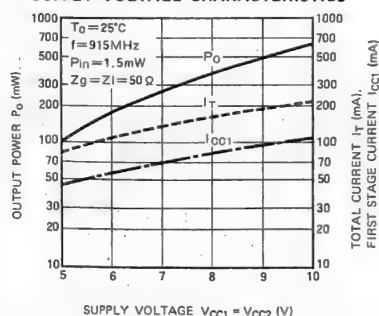
OUTPUT POWER,
FINAL STAGE CURRENT VS.
FINAL STAGE VOLTAGE CHARACTERISTICS



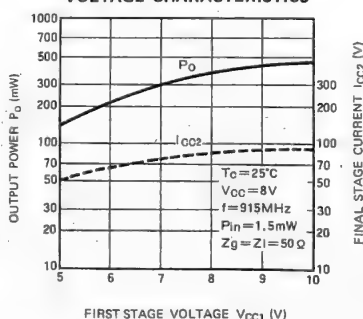
OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICS

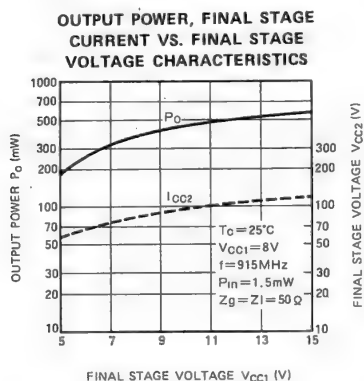


OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



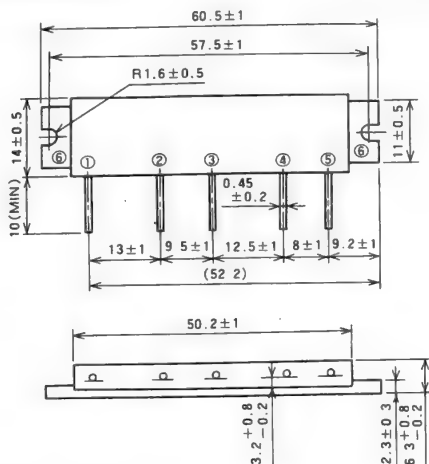
OUTPUT POWER, FINAL
STAGE CURRENT VS. FIRST STAGE
VOLTAGE CHARACTERISTICS





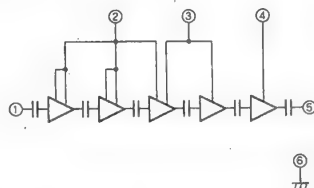
OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

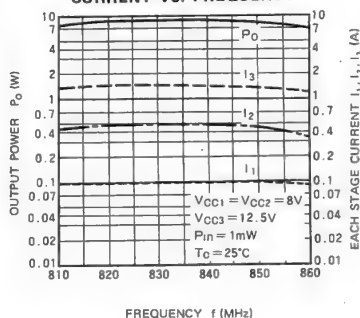
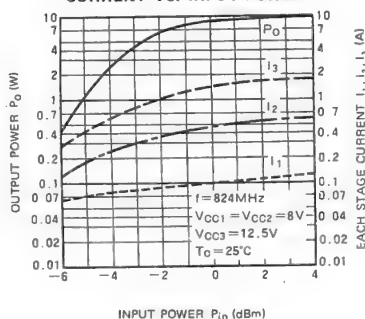
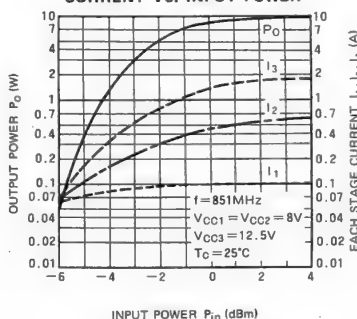
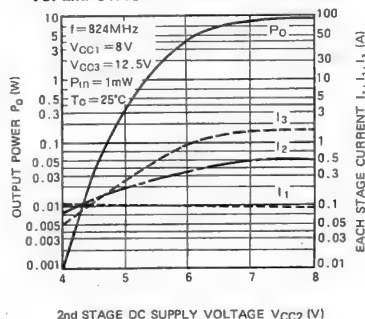
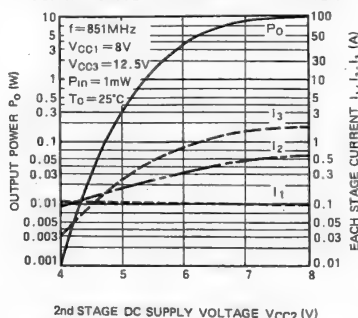
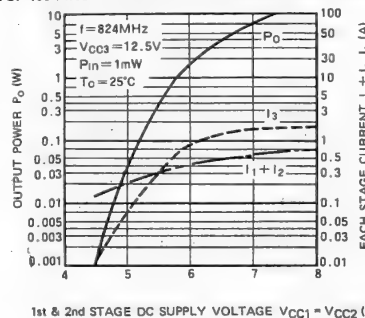
ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	1st. DC supply		9	V
Vcc2	2nd. DC supply		9	V
Vcc3	3rd. DC supply		17	V
Icc	Total current	Z _G = Z _L = 50 Ω	4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, Vcc1 ≤ 8V	7	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

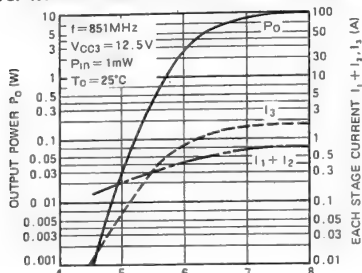
ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		824	851	MHz
P _o	Output power	Vcc1 = Vcc2 = 8V, Vcc3 = 12.5V P _{in} = 1mW	7		W
η _T	Total efficiency	Z _G = Z _L = 50 Ω	35		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	—
—	Load VSWR tolerance	Vcc1 = Vcc2 = 8V, Vcc3 = 12.5V P _o = 7W (P _{in} : controlled), Z _G = 50Ω Load VSWR=20:1 (All phase), 5sec.	No degradation		—

TYPICAL PERFORMANCE DATA

OUTPUT POWER, EACH STAGE
CURRENT VS. FREQUENCYOUTPUT POWER, EACH STAGE
CURRENT VS. INPUT POWEROUTPUT POWER, EACH STAGE
CURRENT VS. INPUT POWEROUTPUT POWER, EACH STAGE CURRENT
VS. 2nd STAGE DC SUPPLY VOLTAGEOUTPUT POWER, EACH STAGE CURRENT
VS. 2nd STAGE DC SUPPLY VOLTAGEOUTPUT POWER, EACH STAGE CURRENT
VS. 1st AND 2nd STAGE DC SUPPLY VOLTAGE2nd STAGE DC SUPPLY VOLTAGE V_{CC2} (V)1st & 2nd STAGE DC SUPPLY VOLTAGE $V_{CC1} = V_{CC2}$ (V)

OUTPUT POWER, EACH STAGE CURRENT VS. 1st AND 2nd STAGE DC SUPPLY VOLTAGE



1st & 2nd STAGE DC SUPPLY VOLTAGE $V_{CC1} = V_{CC2}$ (V)

Table 1: The conditions at standard operation

Stage	V_{CC} (V)	I_T (mA)	P_{in} (mW)	P_O (mW)
1st	8	45	1	20
2nd	8	80	20	200
3rd	8	160	200	500
4th	8	496	500	2000
5th	12.5	1100	2000	7000

DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to the following consideration when designing a heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistances between junction of incorporated transistors and case are shown in the followings.

- First stage transistor
 $R_{th(j-c)1} = 20^\circ\text{C/W}$ (Typ.)
- Second stage transistor
 $R_{th(j-c)2} = 17.5^\circ\text{C/W}$ (Typ.)
- Third stage transistor
 $R_{th(j-c)3} = 16^\circ\text{C/W}$ (Typ.)
- Fourth stage transistor
 $R_{th(j-c)4} = 9^\circ\text{C/W}$ (Typ.)
- Final stage transistor
 $R_{th(j-c)5} = 6.5^\circ\text{C/W}$ (Typ.)

- (2) V_{CC} , I_T , RF input & output power conditions at standard operation for each stage transistors are estimated as follows.

$P_O = 7\text{W}$, $V_{CC1} = V_{CC2} = 8\text{V}$, $V_{CC3} = 12.5\text{V}$, $P_{in} = 1\text{mW}$, $\eta_T = 35\%$ (minimum ratings),
 $I_{1+2} = 0.781\text{A}$ (Total current from 1st stage to 4th stage)
 $I_3 = 1.1\text{A}$ (Current of 5th stage)

The conditions at standard operation for each stage transistors are shown in Table 1.

- Junction temperature of the first stage transistor
 $T_{j1} = (V_{CC1} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_C$ (Note 1)
 $= (8 \times 0.045 - 0.02 + 0.001) \times 20 + T_C$
 $= 6.8 + T_C$ ($^\circ\text{C}$)
 Note 1: Case temperature of device
- Junction temperature of the second stage transistor
 $T_{j2} = (V_{CC1} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_C$
 $= (8 \times 0.08 - 0.2 + 0.02) \times 17.5 + T_C$

$$= 8.1 + T_C$$
 ($^\circ\text{C}$)

- Junction temperature of the third stage transistor
 $T_{j3} = (V_{CC2} \times I_{T3} - P_{O3} + P_{O2}) \times R_{th(j-c)3} + T_C$
 $= (8 \times 0.16 - 0.5 + 0.2) \times 16 + T_C$
 $= 15.7 + T_C$ ($^\circ\text{C}$)
- Junction temperature of the fourth stage transistor
 $T_{j4} = (V_{CC2} \times I_{T4} - P_{O4} + P_{O3}) \times R_{th(j-c)4} + T_C$
 $= (8 \times 0.496 - 2 + 0.5) \times 9 + T_C$
 $= 22.2 + T_C$ ($^\circ\text{C}$)
- Junction temperature of the final stage transistor
 $T_{j5} = (V_{CC3} \times I_{T5} - P_O + P_{O4}) \times R_{th(j-c)5} + T_C$
 $= (12.5 \times 1.1 - 7 + 2) \times 6.5 + T_C$
 $= 56.9 + T_C$ ($^\circ\text{C}$)

2. Heat sink design

In thermal design of heat sink, keep the case temperature below 90°C at output power $P_O = 7\text{W}$ and ambient temperature = 60°C .

The thermal resistance $R_{th(c-a)}$ (Note 2) of the heat sink to realize this:

$$R_{th(c-a)} = \frac{T_C - T_a}{(P_O/\eta_T) - P_O + P_{in}} = \frac{90 - 60}{(7/0.35 - 7 + 0.001)} = 2.31$$
 ($^\circ\text{C/W}$)

Note 2: Including the contact thermal resistance between device and heat sink

Mounting the device on the heat sink with above thermal resistance, junction temperatures of each transistor become;

$$T_{j1} = 97^\circ\text{C}, T_{j2} = 99^\circ\text{C}, T_{j3} = 106^\circ\text{C}, T_{j4} = 113^\circ\text{C}, T_{j5} = 147^\circ\text{C}$$
 at $T_a = 60^\circ\text{C}$, $T_C = 90^\circ\text{C}$.

Since the annual average of ambient temperature is 30°C , junction temperatures of each transistor become;

$$T_{j1} = 67^\circ\text{C}, T_{j2} = 69^\circ\text{C}, T_{j3} = 76^\circ\text{C}, T_{j4} = 76^\circ\text{C}, T_{j5} = 117^\circ\text{C}$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

824~851MHz, 12.5V, 7W, FM MOBILE RADIO

GENERAL

Mitsubishi RF Power Modules for mobile radio applications have high reliability and good performance, as they are designed and manufactured under strict quality control. However, the reliability of semiconductor devices is remarkably affected by usage conditions such as circuit constructions, mounting method, environments, etc.. In order to keep high reliability and obtain good performance when using Mitsubishi RF Power Modules, the following important points concerning maximum ratings, handling, etc., should be noted before use.

1. MAXIMUM RATINGS

Maximum ratings of the RF Power Modules are defined by the "Absolute Maximum Ratings" shown in separate specification sheet. Maximum ratings should not be exceeded in any circumstances, even momentarily. If a device is operated in excess of the absolute maximum ratings, the device may immediately be degraded or destroyed. Furthermore, in designing an electronic circuit using RF power Modules, it is necessary to note that the maximum ratings of the devices should not be exceeded even if external conditions are changed.

2. NORMAL OPERATING VOLTAGE

Normal operating voltage is 12.5 ~ 13.8 volts for Mitsubishi RF Power Modules, because they are designed for mobile radio applications. The regulated 9 volts is recommended for the base biasing voltage of the modules for linear power amplifiers (for SSB).

3. THERMAL DESIGN

In order to keep high reliability of the equipment, it is better to keep the module temperature low. The case temperature of the module, when operated standard conditions, is lower than 90°C under all severe ambient temperature, recommend normally 60°C.

4. MOUNTING and HANDLING

4-1 When the module is mounted on to a heat sink of a equipment, thermal compound to get good heat sinking should be applied between the module's fin and the heat sink. Following thermal compound for good heat sinking is recommended.

G746 Shinetsu Chemical Industry Co., Ltd.

4-2 When mounting a module to the circuit, do not apply excessive stress to the terminal leads or the fin. In particular, if there are some foreign objects between the module and the heat sink, or if there are some burrs or rising on the surface of the heat sink, it may happen that the substrate of the module will crack or break due to excessive stress from screwing the module on to the heat sink. Therefore, the surface of the heat sink in contact with the module must be as flat as possible.

When screwing a module to the heat sink, torque screw is recommended as 5 to 6kg-cm when using $\phi 3\text{mm}$ screws.

4-3 For soldering, the major precautions are as follows:

1) Flux;

Roles of flux are to remove oxidized layer on the

object, and prevent from oxidation during heating or lowering surface tension on the objects. Rosin flux, which is less corrosional and highly insulative, is recommended.

2) Soldering temperature;

The temperature of the lead soldering should be lower than 260°C and shorter than 10 seconds, or lower than 350°C and shorter than 3 seconds.

3) Cleaning after soldering;

The recommended solvent for cleaning the residual flux is the Ethyl Alcohol. Trichlene type solvents should not be used.

4-4 When the module is screwed after soldering the terminal leads to the circuit board, excessive stress is applied to the leads. Therefore, please solder the terminal leads to the circuit board after screwing the module to the heat sink.

4-5 If the module falls onto a hard surface, it will be damaged by mechanical shock and can no longer be used.

4-6 To obtain good stability and electrical performances, it is necessary to take precautions concerning the earth potential of the module. As the fin is the ground terminal, the fin should be connected to the ground of the set completely in RF condition.

4-7 The values of input VSWR and output VSWR of the module indicated in the specification sheet are guaranteed when the input and output leads are straight and these leads are connected to the load 50 Ω within 10mm length. If the device is mounted under different conditions from these mentioned above, the performances, such as output power and efficiency, may be degraded due to the impedance mismatch. In order to reform such an impedance mismatch, please set the additional matching circuits to get good impedance matching.

5. VOLTAGE SUPPLY

The modules have 2 or 3 terminals for DC power supply. If these terminals are combined without RFC (Radio Frequency Choke), or if each terminal is not bypassed with the condenser, parasitic oscillation occasionally may occur. Therefore, the DC Power Supply Terminals should be combined with RFC, and each terminal bypassed with the condensers (10 μF and 4700pF in Parallel).

The first stage transistor of the module even for FM is operated in class AB. When excessively high voltage is applied to the first stage DC Power Supply Terminal, the first stage transistor may be destroyed due to current runaway. Therefore, the first stage supply voltage must be controlled, not exceeding 17 volts DC.

6. GUARANTEED CHARACTERISTICS

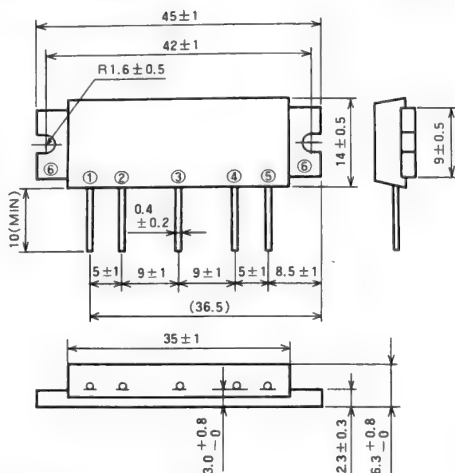
All the graphic characteristics illustrated in this catalog are typical examples. The characteristics of individual devices as specified in the tables of absolute maximum ratings and electrical characteristics are guaranteed under the specified conditions.

M57783L

135~160MHz, 7.5V, 7W, FM PORTABLE RADIO

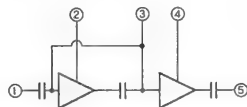
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③VBB : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

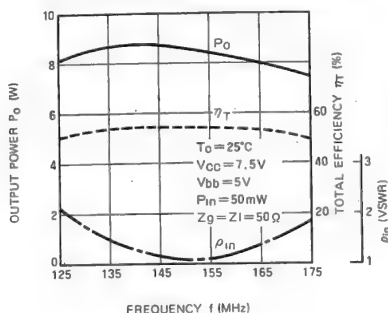
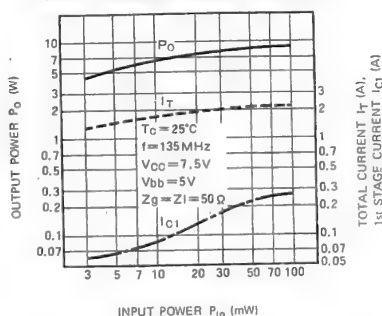
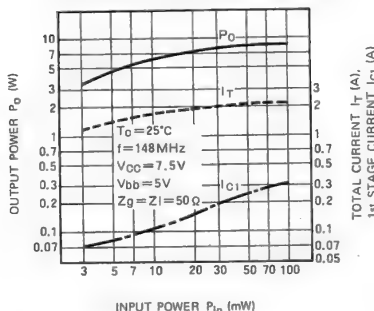
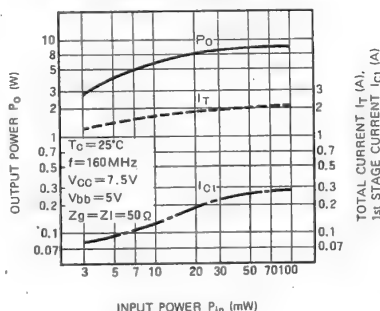
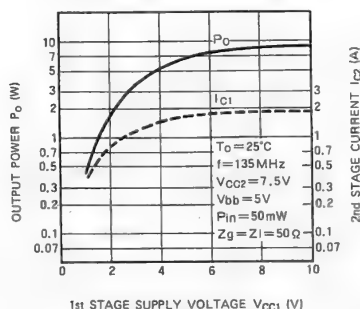
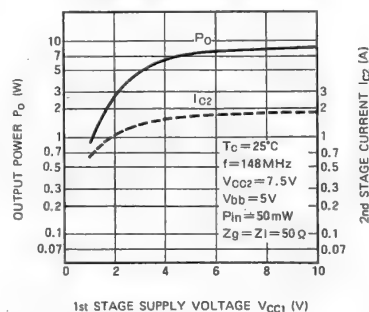
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		9	V
VBB			6	V
Icc	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	100	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		135	160	MHz
P _o	Output power	P _{in} = 50mW	7		W
η_T	Total efficiency	V _{BB} = 5V	45		%
2f ₀	2nd. harmonic	V _{cc} = 7.5V		-20	dB
3f ₀	3rd. harmonic	Z ₀ = Z _L = 50 Ω		-30	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{cc} = 13V, V _{BB} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

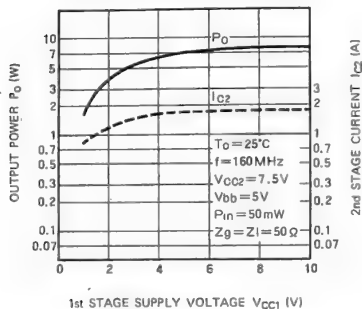
135~160MHz, 7.5V, 7W, FM PORTABLE RADIO

TYPICAL PERFORMANCE DATA

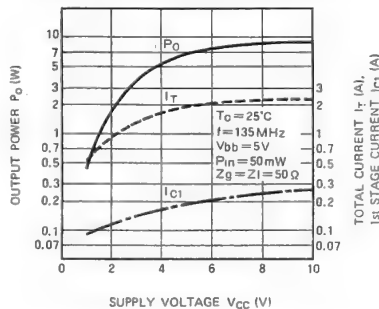
OUTPUT POWER, TOTAL EFFICIENCY, ρ_{in}
VS. FREQUENCY CHARACTERISTICS

OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICS

OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICS

OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICS

OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS

OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS


135~160MHz, 7.5V, 7W, FM PORTABLE RADIO

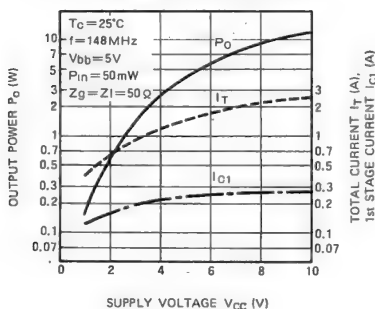
OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



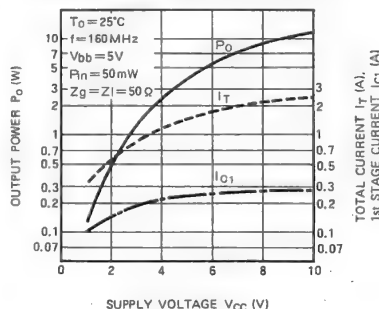
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICS



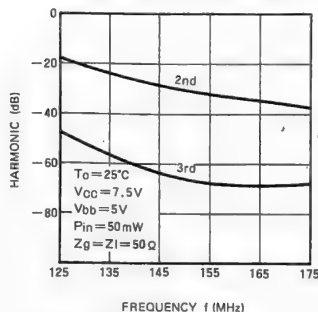
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICS



OUTPUT POWER, TOTAL CURRENT
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICS



2nd, 3rd HARMONIC VS.
FREQUENCY CHARACTERISTICS

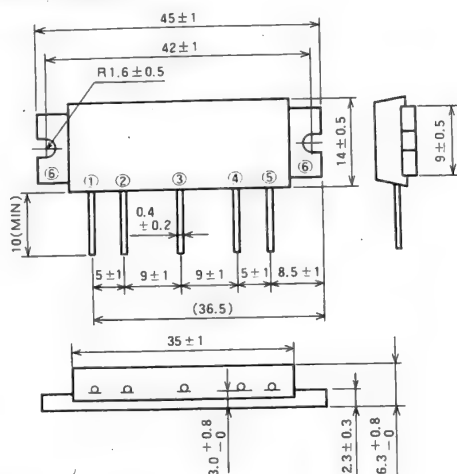


M57783H

150~175MHz, 7.5V, 7W, FM PORTABLE RADIO

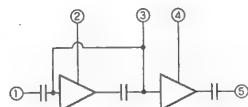
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ① P_{in} : RF INPUT
- ② V_{CC1} : 1st. DC SUPPLY
- ③ V_{BB} : BASE BIAS
- ④ V_{CC2} : 2nd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

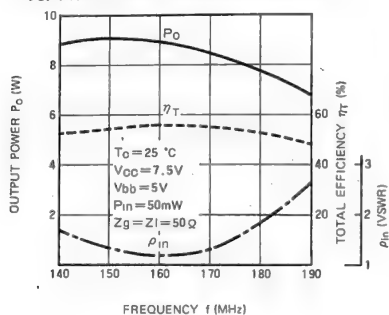
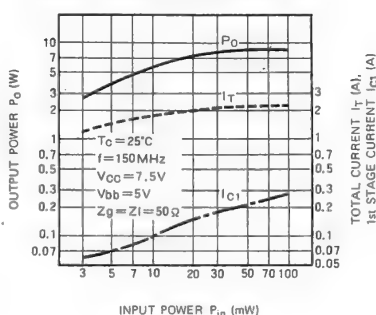
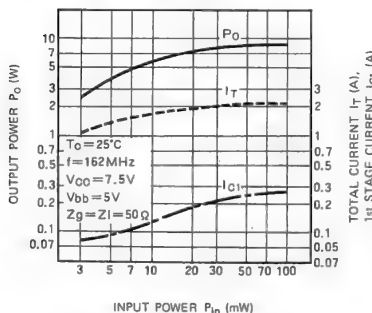
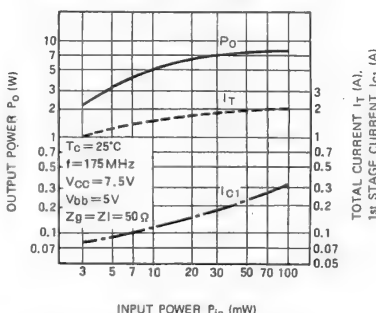
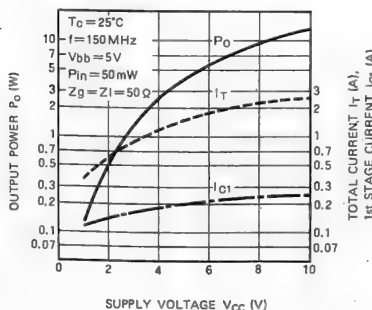
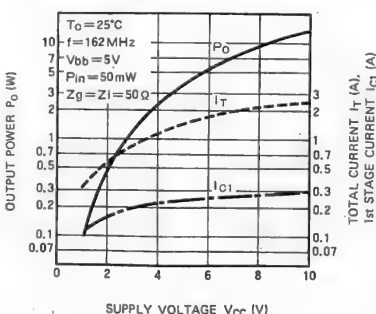
ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		9	V
V_{BB}			6	V
I_{CC}	Total current		4	A
$P_{in(max)}$	Input power	$Z_G = Z_L = 50 \Omega$	100	mW
$P_{o(max)}$	Output power	$Z_G = Z_L = 50 \Omega$	10	W
$T_{C(OP)}$	Operation case temperature		-30~110	$^\circ\text{C}$
T_{stg}	Storage temperature		-40~110	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

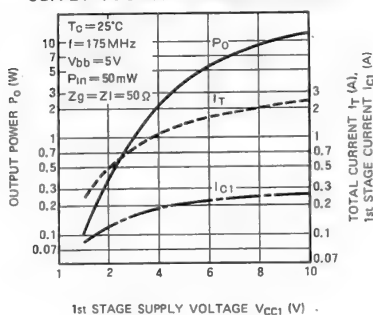
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		150	175	MHz
P_o	Output power	$P_{in} = 50\text{mW}$	7		W
η_T	Total efficiency	$V_{BB} = 5\text{V}$	45		%
$2f_o$	2nd. harmonic	$V_{CC} = 7.5\text{V}$		-20	dB
$3f_o$	3rd. harmonic	$Z_G = Z_L = 50 \Omega$		-30	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	$V_{CC} = 13\text{V}$, $V_{BB} = 5\text{V}$ $P_o = 7\text{W}$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

TYPICAL PERFORMANCE DATA

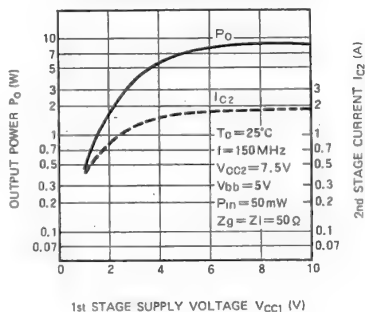
OUTPUT POWER, TOTAL EFFICIENCY, ρ_{in}
VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
1st STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER TOTAL CURRENT,
1st STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS

150~175MHz, 7.5V, 7W, FM PORTABLE RADIO

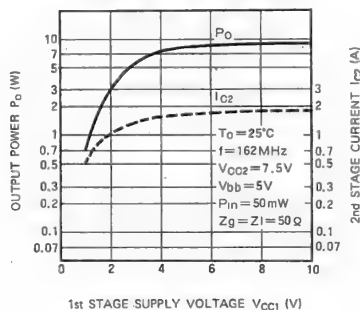
OUTPUT POWER TOTAL CURRENT
1st STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



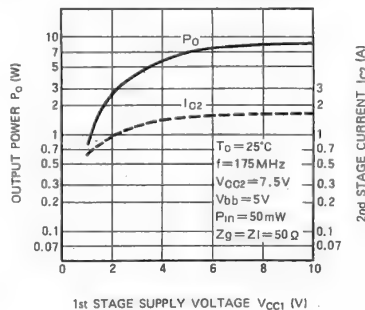
OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



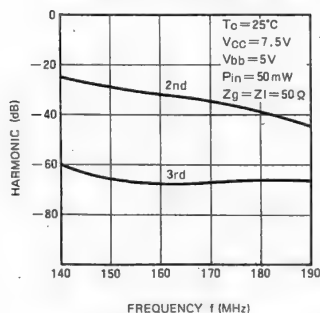
OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



2nd, 3rd HARMONIC VS.
FREQUENCY CHARACTERISTICS

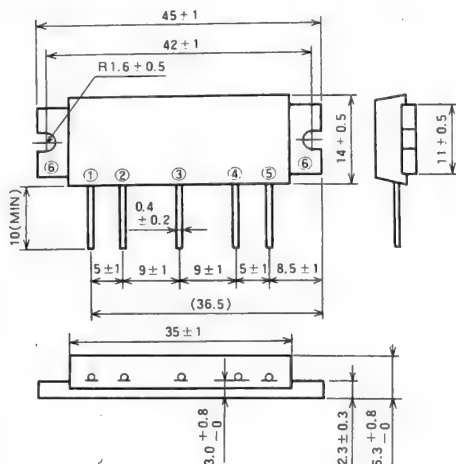


M57786UL

360~380MHz, 7.2V, 6W, FM PORTABLE RADIO

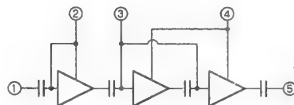
OUTLINE DRAWING

Dimensions in mm



H12

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② VCC1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS
- ④ VCC2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : PIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	Vbb ≤ 5V	10	V
Vbb		Vcc ≤ 7.2V	6	V
Icc	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	100	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

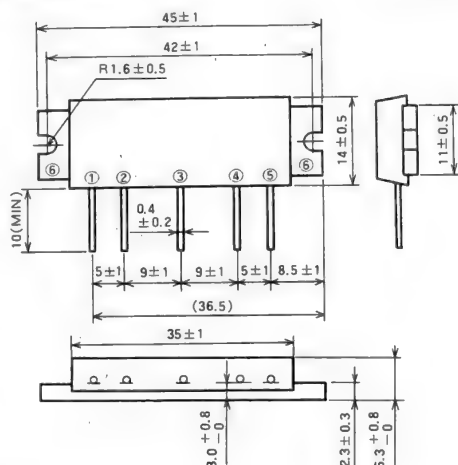
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		360	380	MHz
P _o	Output power	P _{in} = 50mW	6		W
η _T	Total efficiency	Vbb = 5V	38		%
2fo	2nd. harmonic	Vcc = 7.2V		-25	dB
3fo	3rd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	Vcc = 7.2V, Vbb = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

M57786L

400~430MHz, 7.2V, 7W, FM PORTABLE RADIO

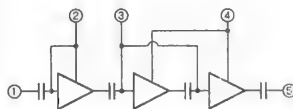
OUTLINE DRAWING

Dimensions in mm



H12

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

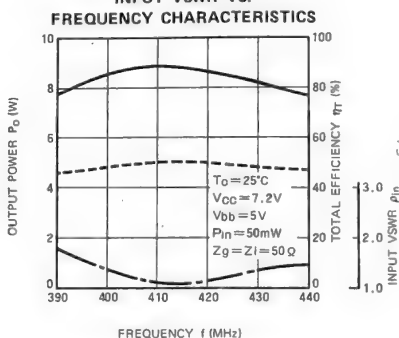
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage	V _{bb} ≤ 5V	10	V
V _{bb}		V _{cc} ≤ 7.2V	6	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	100	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

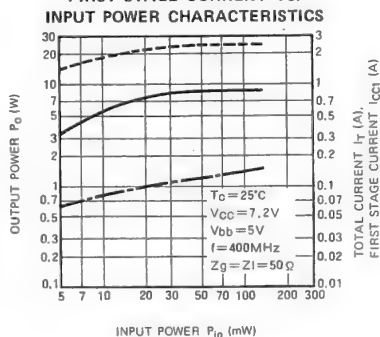
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		400	430	MHz
P _o	Output power	P _{in} = 50mW	7		W
η _T	Total efficiency	V _{bb} = 5V	40		%
2f _o	2nd. harmonic	V _{cc} = 7.2V		-25	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{cc} = 7.2V, V _{bb} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

400~430MHz, 7.2V, 7W, FM PORTABLE RADIO

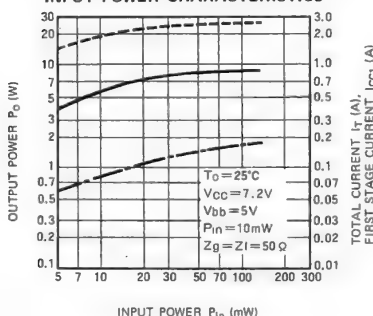
TYPICAL PERFORMANCE DATA OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS.



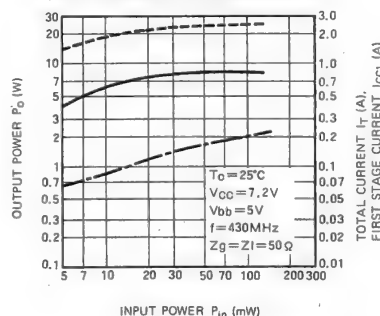
OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS.



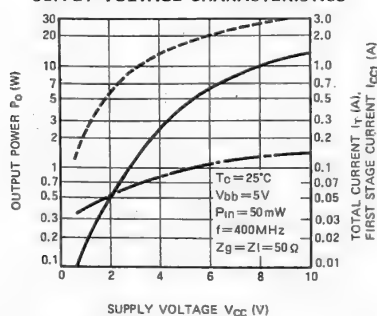
OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



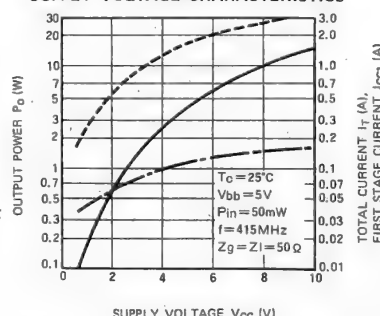
OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

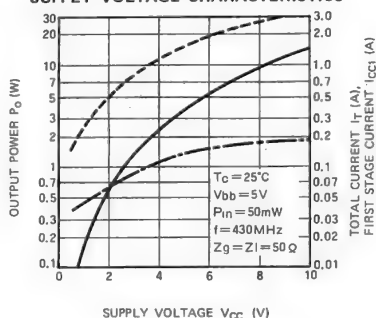


OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

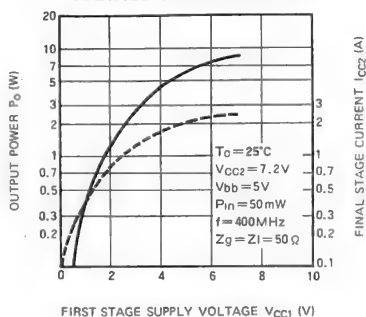


400~430MHz, 7.2V, 7W, FM PORTABLE RADIO

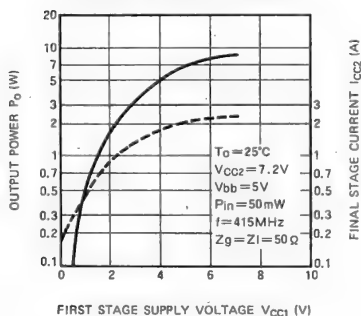
OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



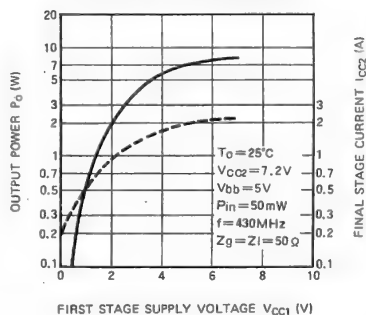
OUTPUT POWER, FINAL STAGE
CURRENT VS. FIRST STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, FINAL STAGE
CURRENT VS. FIRST STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, FINAL STAGE
CURRENT VS. FIRST STAGE SUPPLY
VOLTAGE CHARACTERISTICS

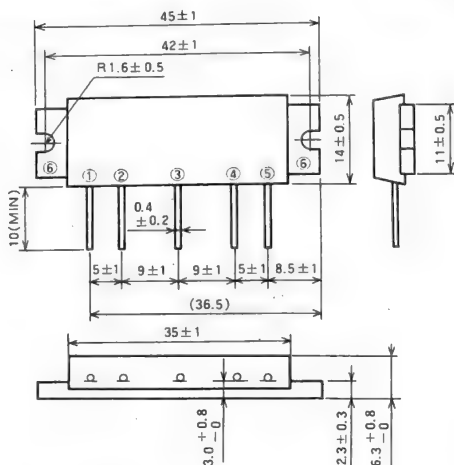


M57786M

430~470MHz, 7.2V, 7W, FM PORTABLE RADIO

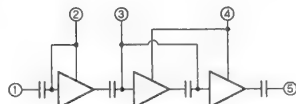
OUTLINE DRAWING

Dimensions in mm



H12

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③VBB : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

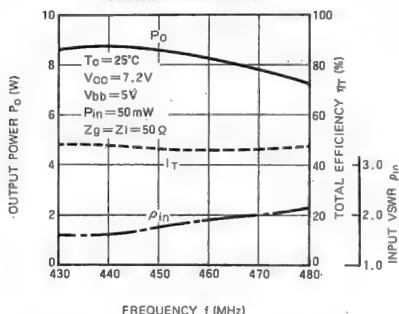
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	$V_{BB} \leq 5V$	10	V
VBB		$V_{CC} \leq 7.2V$	6	V
Icc	Total current		4	A
P _{in(max)}	Input power	$Z_G = Z_L = 50 \Omega$	100	mW
P _{o(max)}	Output power	$Z_G = Z_L = 50 \Omega$	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

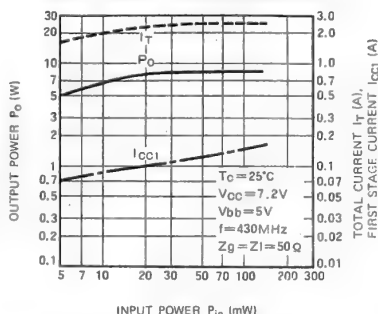
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		430	470	MHz
P _o	Output power	P _{in} = 50mW	7		W
η_T	Total efficiency	V _{BB} = 5V	40		%
2f _o	2nd. harmonic	V _{CC} = 7.2V		-25	dB
3f _o	3rd. harmonic	$Z_G = Z_L = 50 \Omega$		-30	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{CC} = 7.2V, V _{BB} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

TYPICAL PERFORMANCE DATA

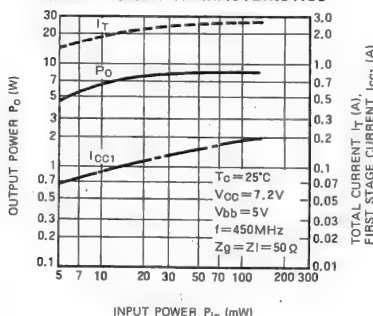
OUTPUT POWER, TOTAL EFFICIENCY INPUT VSWR VS. FREQUENCY CHARACTERISTICS



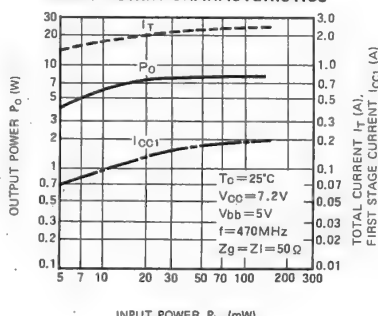
OUTPUT POWER, TOTAL CURRENT FIRST STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



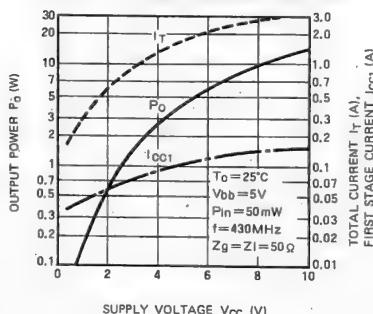
OUTPUT POWER, TOTAL CURRENT FIRST STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



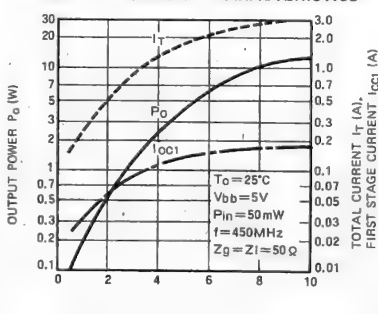
OUTPUT POWER, TOTAL CURRENT FIRST STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



OUTPUT POWER, TOTAL CURRENT FIRST STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

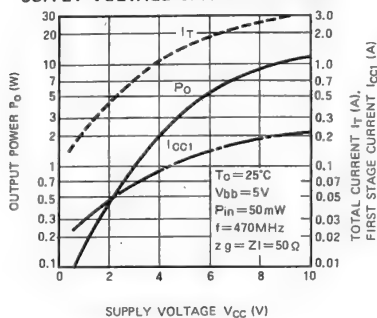


OUTPUT POWER, TOTAL CURRENT FIRST STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

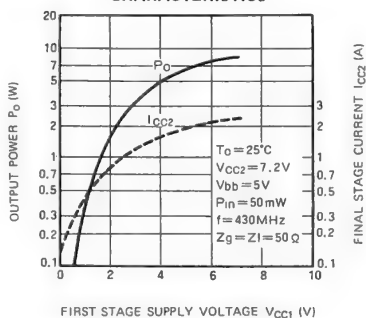


430-470MHz, 7.2V, 7W, FM PORTABLE RADIO

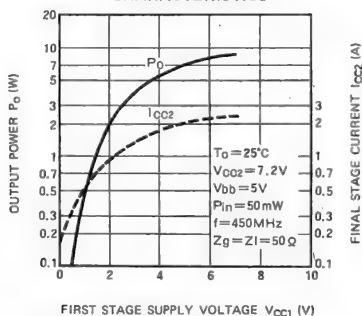
OUTPUT POWER, TOTAL CURRENT
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



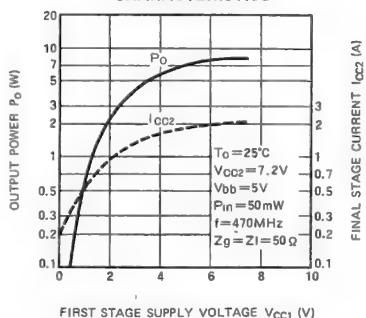
OUTPUT POWER, FINAL STAGE CURRENT
VS. FIRST STAGE SUPPLY VOLTAGE
CHARACTERISTICS



OUTPUT POWER, FINAL STAGE CURRENT
VS. FIRST STAGE SUPPLY VOLTAGE
CHARACTERISTICS



OUTPUT POWER, FINAL STAGE CURRENT
VS. FIRST STAGE SUPPLY VOLTAGE
CHARACTERISTICS

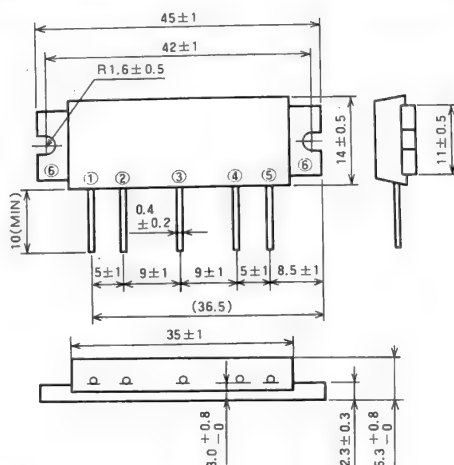


M57786H

470~512MHz, 7.2V, 7W, FM PORTABLE RADIO

OUTLINE DRAWING

Dimensions in mm



H12

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	$V_{bb} \leq 5V$	10	V
Vbb		$V_{cc} \leq 7.2V$	6	V
Icc	Total current		4	A
P _{in(max)}	Input power	$Z_0 = Z_L = 50 \Omega$	100	mW
P _{o(max)}	Output power	$Z_0 = Z_L = 50 \Omega$	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

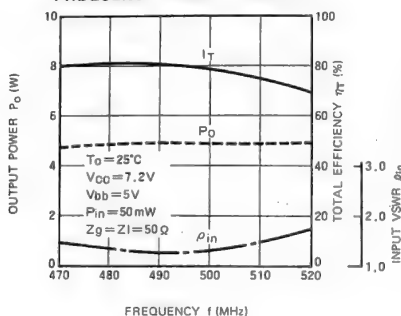
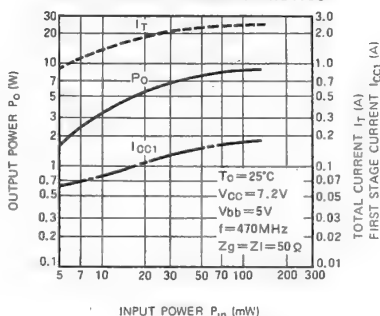
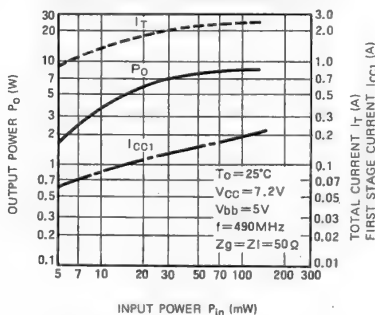
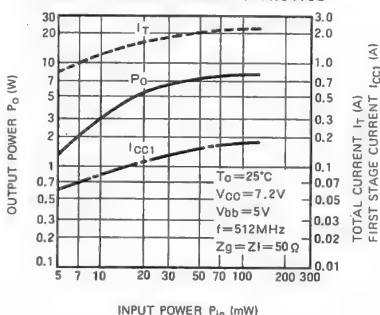
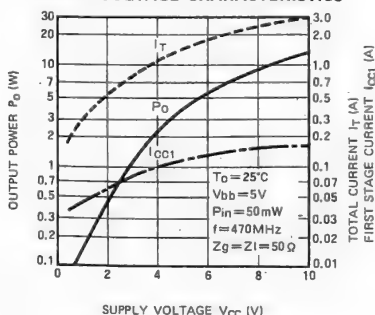
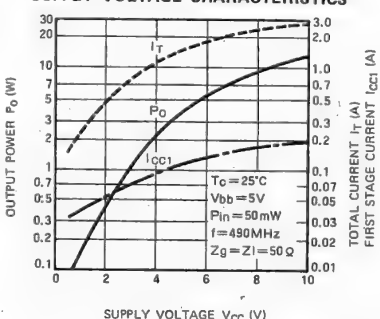
ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		470	512	MHz
P _o	Output power	P _{in} = 50mW	7		W
η_T	Total efficiency	V _{bb} = 5V	40		%
2f _o	2nd. harmonic	V _{cc} = 7.2V		-25	dB
3f _o	3rd. harmonic	Z ₀ = Z _L = 50 Ω		-30	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{cc} = 7.2V, V _{bb} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

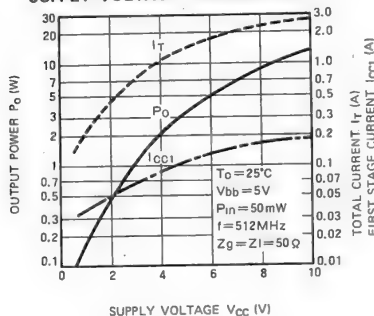
TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS.

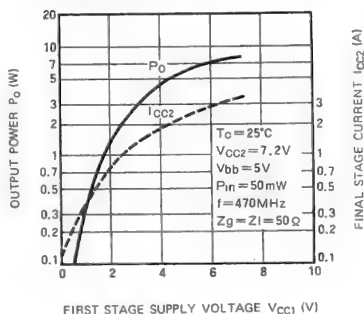
FREQUENCY CHARACTERISTICS

OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS

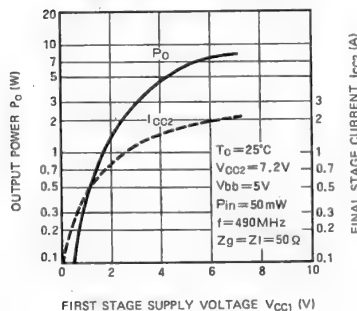
OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



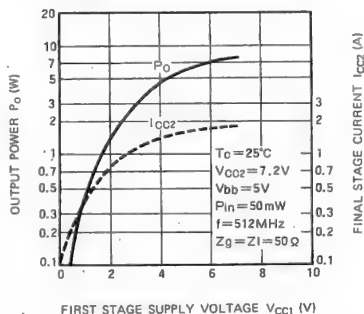
OUTPUT POWER, FINAL STAGE
CURRENT VS. FIRST STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, FINAL STAGE
CURRENT VS. FIRST STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, FINAL STAGE
CURRENT VS. FIRST STAGE SUPPLY
VOLTAGE CHARACTERISTICS

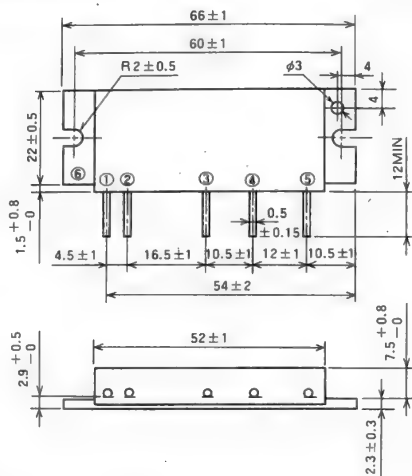


M57788L

400~430MHz, 12.5V, 40W, FM MOBILE RADIO

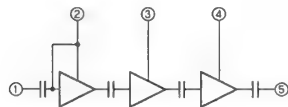
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :-

- ① P_{in} : RF INPUT
- ② V_{cc1} : 1st. DC SUPPLY
- ③ V_{cc2} : 2nd. DC SUPPLY
- ④ V_{cc3} : 3rd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

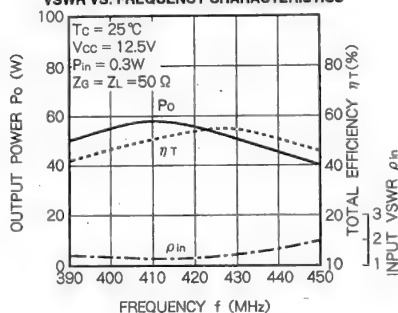
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		16	V
V _{cc2,3}			17	V
I _{cc}	Total current		12	A
P _{in(max)}	Input power	Z _g = Z _L = 50 Ω	0.5	W
P _{o(max)}	Output power	Z _g = Z _L = 50 Ω	50	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

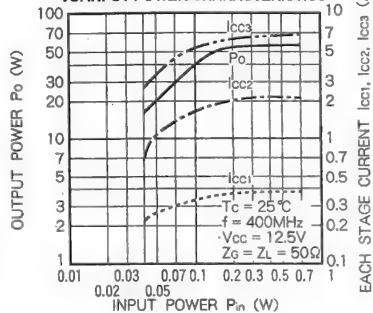
Symbol	Parameter	Test conditions	Limits		Unit
f	Frequency range		Min	Max	MHz
P _o	Output power	P _{in} = 0.3W	400	430	W
η _T	Total efficiency	V _{cc} = 12.5V	40		%
2f _o	2nd. harmonic	Z _g = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 40W (P _{in} : controlled) Load VSWR=8.8:1 (All phase), 2sec. Z _g = 50 Ω	No degradation		-

TYPICAL PERFORMANCE DATA

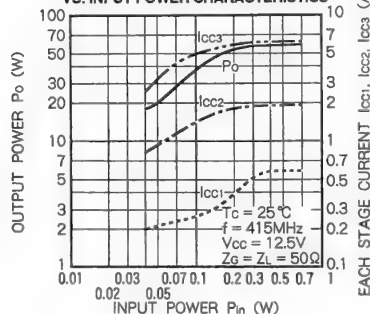
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



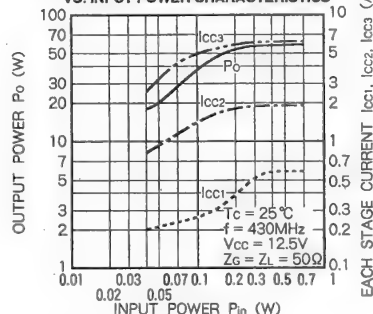
OUTPUT POWER, EACH STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



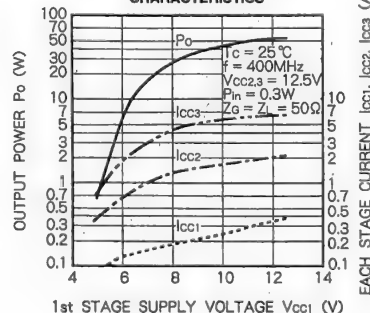
OUTPUT POWER, EACH STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



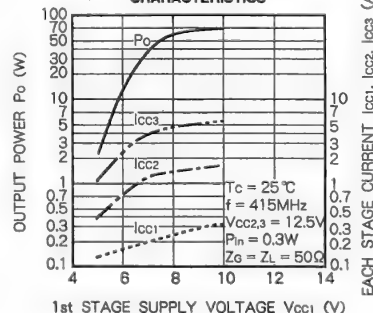
OUTPUT POWER, EACH STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



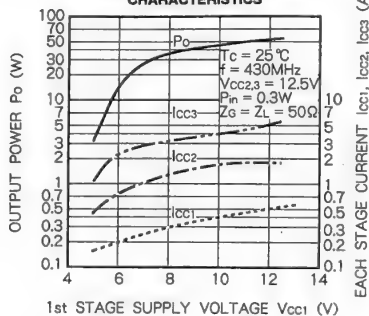
OUTPUT POWER, EACH STAGE CURRENT VS. 1st STAGE SUPPLY VOLTAGE CHARACTERISTICS



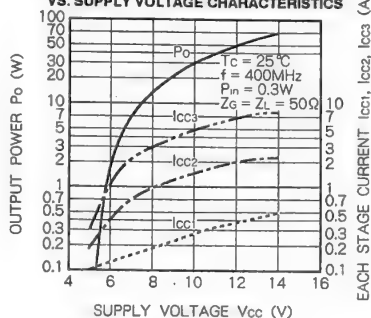
OUTPUT POWER, EACH STAGE CURRENT VS. 1st STAGE SUPPLY VOLTAGE CHARACTERISTICS



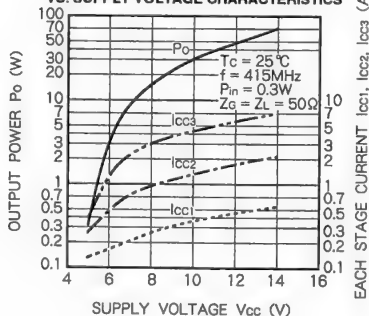
OUTPUT POWER, EACH STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS



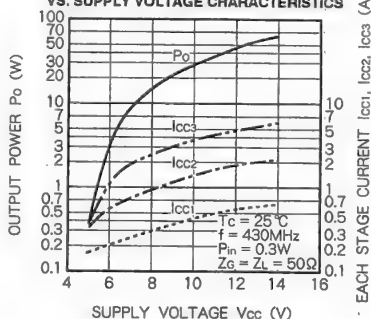
OUTPUT POWER, EACH STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS

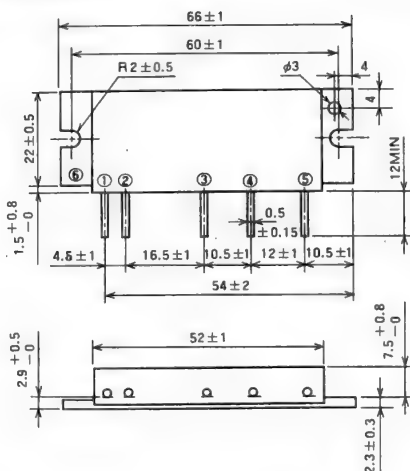


M57788M

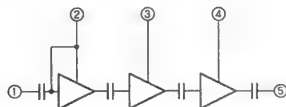
430~450MHz, 12.5V, 40W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM

PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

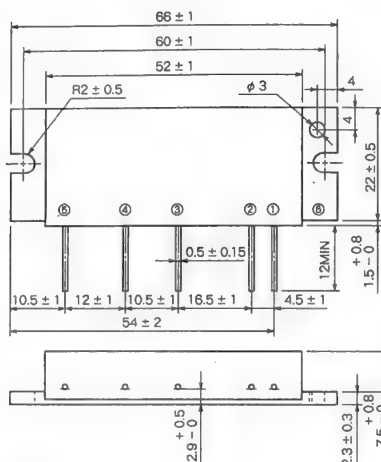
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	Supply voltage		16	V
Vcc2,3			17	V
Icc	Total current		12	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.5	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	50	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.4W Vcc = 12.5V Z _G = Z _L = 50 Ω	430	450	MHz
P _o	Output power		40		W
η _T	Total efficiency		40		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V, P _o = 40W (P _{in} : controlled) Load VSWR=8.8:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

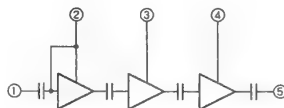
OUTLINE DRAWING

Dimensions in mm



H3R

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vcc2 : 2nd. DC SUPPLY
④Vcc3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		12	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.5	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	50	W
T _{c(OP)}	Operation case temperature		- 30 ~ 110	°C
T _{stg}	Storage temperature		- 40 ~ 110	°C

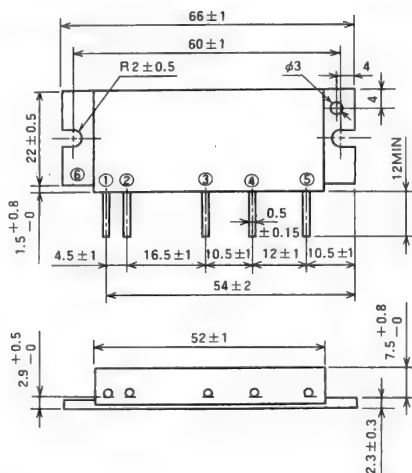
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.4W$ $V_{cc} = 13.5V$ $Z_0 = Z_L = 50 \Omega$	430	450	MHz
Po	Output power		45		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 40W$ (P_{in} : controlled) Load VSWR=8. 8:1 (All phase), 2sec. $Z_0 = 50 \Omega$	No degradation		-

M57788H

450~470MHz, 12.5V, 40W, FM MOBILE RADIO

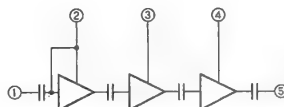
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		16	V
V _{cc2,3}			17	V
I _{cc}	Total current		12	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.5	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	50	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

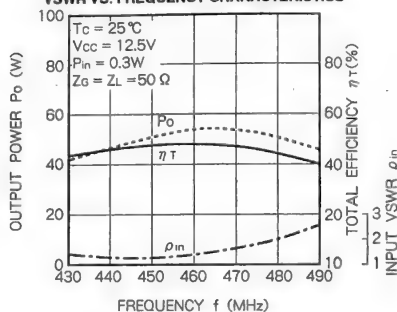
ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.3W V _{cc} = 12.5V Z _G = Z _L = 50 Ω	450	470	MHz
P _o	Output power		40		W
η _T	Total efficiency		40		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 40W (P _{in} : controlled) Load VSWR=8.8:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

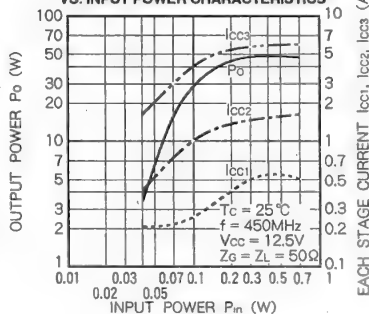
450~470MHz, 12.5V, 40W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

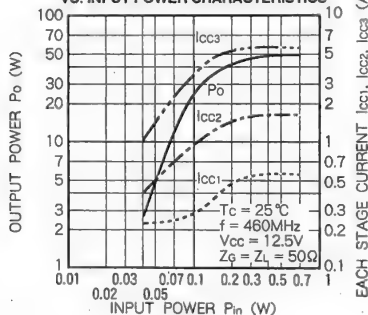
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



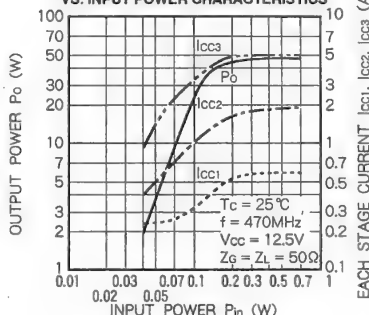
OUTPUT POWER, EACH STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



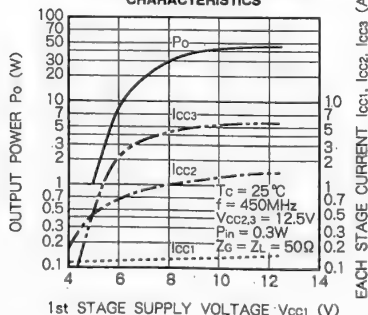
OUTPUT POWER, EACH STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



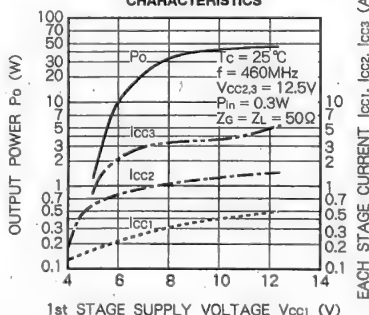
OUTPUT POWER, EACH STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



OUTPUT POWER, EACH STAGE CURRENT VS. 1st STAGE SUPPLY VOLTAGE CHARACTERISTICS

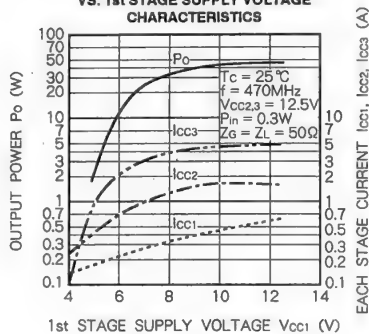


OUTPUT POWER, EACH STAGE CURRENT VS. 1st STAGE SUPPLY VOLTAGE CHARACTERISTICS

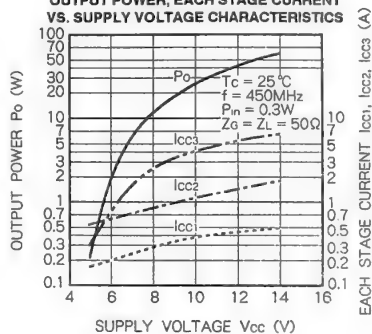


450-470MHz, 12.5V, 40W, FM MOBILE RADIO

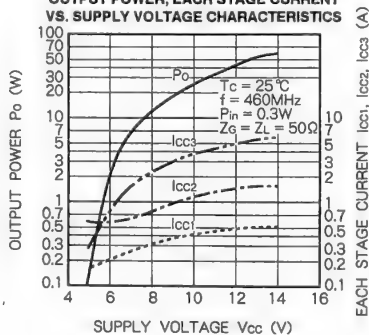
OUTPUT POWER, EACH STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS



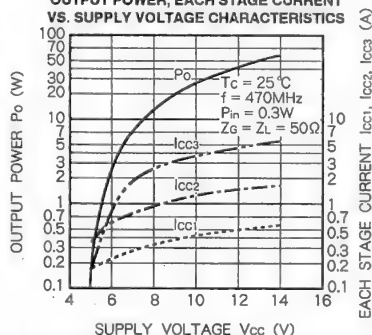
OUTPUT POWER, EACH STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS

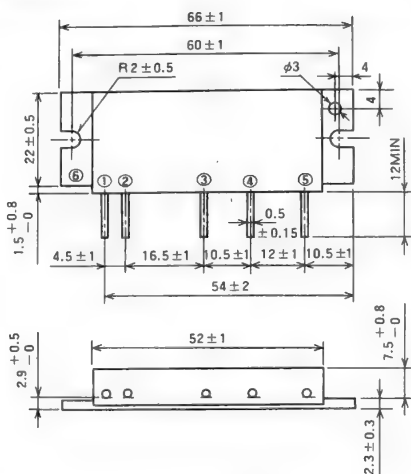


M57788UH

470~490MHz, 12.5V, 40W, FM MOBILE RADIO

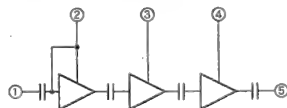
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN:

- ① PIN : RF INPUT
- ② VCC1 : 1st. DC SUPPLY
- ③ VCC2 : 2nd. DC SUPPLY
- ④ VCC3 : 3rd. DC SUPPLY
- ⑤ PO : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

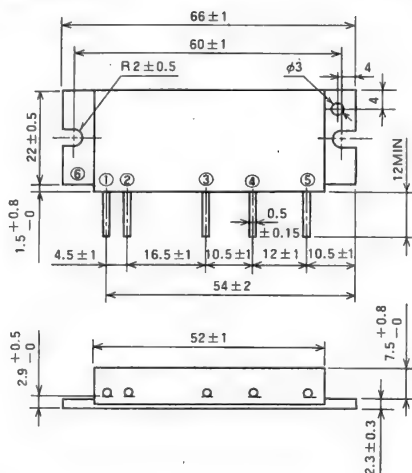
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		16	V
V _{cc2,3}			17	V
I _{cc}	Total current		12	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.5	W
P _{O(max)}	Output power	Z _G = Z _L = 50 Ω	50	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.3W V _{cc} = 12.5V Z _G = Z _L = 50 Ω	470	490	MHz
P _o	Output power		40		W
η _T	Total efficiency		40		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 40W (P _{in} : controlled) Load VSWR = 8:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

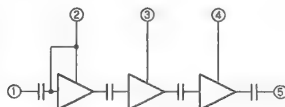
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vcc2 : 2nd. DC SUPPLY
④Vcc3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Rating	Unit
V _{cc}	Supply voltage		16	V
V _{cc2,3}			17	V
I _{cc}	Total current		12	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.5	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	50	W
T _{c(op)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

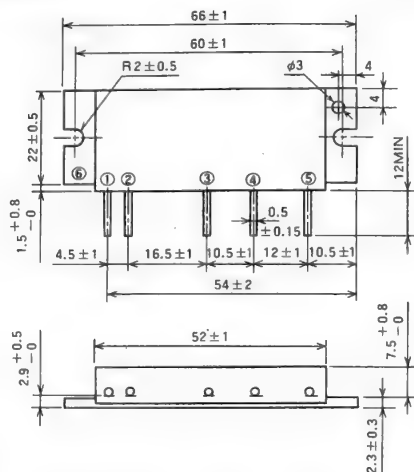
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		490	512	MHz
Po	Output power	P _{in} = 0.3W	40		W
η_T	Total efficiency	V _{cc} = 12.5V	40		%
2fo	2nd. harmonic	Z _o = Z _L = 50 Ω		- 30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, Po = 40W (P _{in} : controlled) Load VSWR=8:1 (All phase), 2sec. Z _o = 50 Ω	No degradation		-

M57789

890~915MHz, 12.5V, 12W, FM MOBILE RADIO

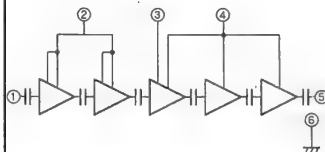
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25 °C unless otherwise noted)

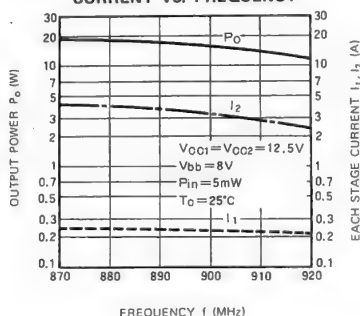
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	1st. DC supply		13	V
Vbb	Base bias		9	V
Vcc2	2nd. DC supply		17	V
Icc	Total current	Z _G = Z _L = 50 Ω	5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, Vcc1 ≤ 12.5V	10	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
Tc(op)	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25 °C unless otherwise noted)

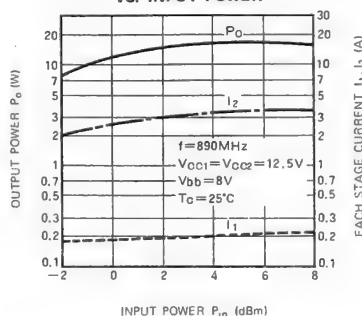
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		890	915	MHz
P _o	Output power	Vcc1 = Vcc2 = 12.5, Vbb = 8V	12		W
η _T	Total efficiency	P _{in} = 5mW	30		%
2fo	2nd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc1=12.5V, Vcc2=15.2V, Vbb=8V P _o = 12W(P _{in} : controlled), Z _G = 50Ω Load VSWR=20:1 (All phase), 5sec.	No degradation		-

TYPICAL PERFORMANCE DATA

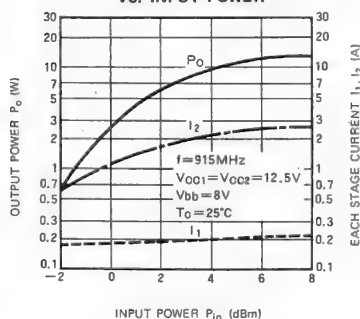
OUTPUT POWER, EACH STAGE
CURRENT VS. FREQUENCY



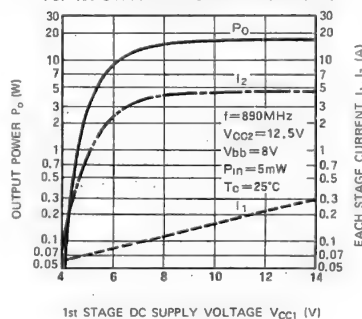
OUTPUT POWER, EACH STAGE CURRENT
VS. INPUT POWER



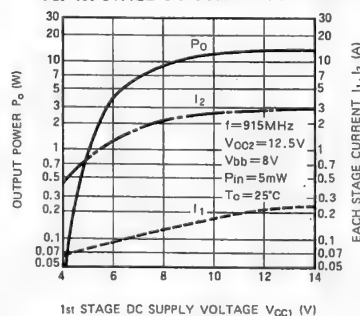
OUTPUT POWER, EACH STAGE CURRENT
VS. INPUT POWER



OUTPUT POWER, EACH STAGE CURRENT
VS. 1st STAGE DC SUPPLY VOLTAGE



OUTPUT POWER, EACH STAGE CURRENT
VS. 1st STAGE DC SUPPLY VOLTAGE



OUTPUT POWER, EACH STAGE CURRENT
VS. 1st AND 2nd STAGE DC SUPPLY VOLTAGE

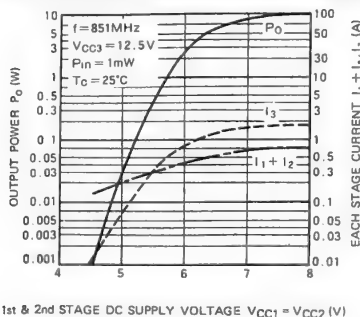


Table 1: The conditions at standard operation

Stage	V_{CC} (V)	I_T (mA)	P_{in} (mW)	P_O (mW)
1st	12.5	60	5	30
2nd	12.5	170	30	400
3rd	12.5	280	400	1300
4th	12.5	770	1300	4800
5th	12.5	1920	4800	12000

DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to the following consideration when designing a heat sink.

1. Junction temperature of incorporated transistors at standard operation.

(1) Thermal resistances between junction of incorporated transistors and case are shown in the followings.

- First stage transistor
 $R_{th(j-c)1} = 20^\circ\text{C/W}$ (Typ.)
- Second stage transistor
 $R_{th(j-c)2} = 17.5^\circ\text{C/W}$ (Typ.)
- Third stage transistor
 $R_{th(j-c)3} = 15^\circ\text{C/W}$ (Typ.)
- Fourth stage transistor
 $R_{th(j-c)4} = 7.5^\circ\text{C/W}$ (Typ.)
- Final stage transistor
 $R_{th(j-c)5} = 3.75^\circ\text{C/W}$ (Typ.)

(2) V_{CC} , I_T , RF input & output power conditions at standard operation for each stage transistors are estimated as follows.

$P_O = 12\text{W}$, $V_{CC1} = V_{CC2} = V_{CC3} = 12.5\text{V}$, $P_{in} = 5\text{mW}$,
 $\eta_T = 30\%$ (minimum ratings),
 $I_1 = 0.23\text{A}$ (Total current from 1st stage to 2nd stage)
 $I_2 = 2.97\text{A}$ (Total current from 3rd stage to 5th stage)
 The conditions at standard operation for each stage transistors are shown in Table 1.

- Junction temperature of the first stage transistor
 $T_{j1} = (V_{CC1} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_c$ (Note 1)
 $= (12.5 \times 0.06 - 0.02 + 0.005) \times 20 + T_c$
 $= 14.6 + T_c$ ($^\circ\text{C}$)

Note 1: Case temperature of device

- Junction temperature of the second stage transistor
 $T_{j2} = (V_{CC1} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_c$
 $= (12.5 \times 0.17 - 0.4 + 0.03) \times 17.5 + T_c$
 $= 30.7 + T_c$ ($^\circ\text{C}$)

- Junction temperature of the third stage transistor

$$T_{j3} = (V_{CC2} \times I_{T3} - P_{O3} + P_{O2}) \times R_{th(j-c)3} + T_c$$

$$= (12.5 \times 0.28 - 1.3 + 0.4) \times 15 + T_c$$

$$= 39.0 + T_c$$
 ($^\circ\text{C}$)

- Junction temperature of the fourth stage transistor

$$T_{j4} = (V_{CC2} \times I_{T4} - P_{O4} + P_{O3}) \times R_{th(j-c)4} + T_c$$

$$= (12.5 \times 0.77 - 4.8 + 1.3) \times 7.5 + T_c$$

$$= 45.9 + T_c$$
 ($^\circ\text{C}$)

- Junction temperature of the final stage transistor

$$T_{j5} = (V_{CC3} \times I_{T5} - P_{O5} + P_{O4}) \times R_{th(j-c)5} + T_c$$

$$= (12.5 \times 1.92 - 12 + 4.8) \times 3.75 + T_c$$

$$= 63.0 + T_c$$
 ($^\circ\text{C}$)

2. Heating sink design

In thermal design of heat sink, keep the case temperature below 90°C at output power $P_O = 12\text{W}$ and ambient temperature = 60°C .

The thermal resistance $R_{th(c-a)}$ (Note 2) of the heat sink to realize this:

$$R_{th(c-a)} = \frac{T_c - T_a}{(P_O/\eta_T) - P_P + P_{in}} = \frac{90 - 60}{(12/0.3 - 12 + 0.001)}$$

$$= 1.00$$
 ($^\circ\text{C/W}$)

Note 2: Including the contact thermal resistance between device and heat sink

Mounting the device on the heat sink with above thermal resistance, junction temperatures of each transistor become;

$$T_{j1} = 105^\circ\text{C}, T_{j2} = 121^\circ\text{C}, T_{j3} = 129^\circ\text{C}, T_{j4} = 136^\circ\text{C},$$

$$T_{j5} = 153^\circ\text{C}$$
 at $T_a = 60^\circ\text{C}$, $T_c = 90^\circ\text{C}$.

Since the annual average of ambient temperature is 30°C , junction temperatures of each transistor become;

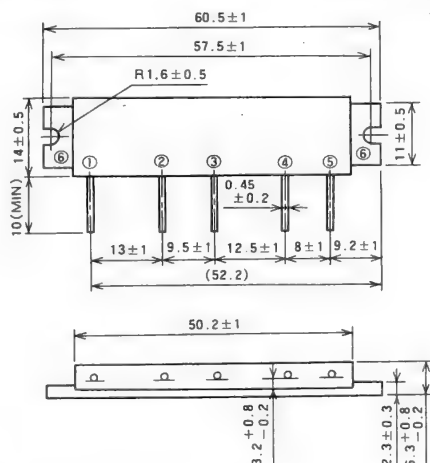
$$T_{j1} = 75^\circ\text{C}, T_{j2} = 91^\circ\text{C}, T_{j3} = 99^\circ\text{C}, T_{j4} = 106^\circ\text{C},$$

$$T_{j5} = 123^\circ\text{C}.$$

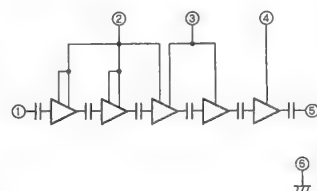
As the maximum junction temperature of these incorporated transistors T_{jmax} are 153°C , application under fully derated condition is ensured.

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

- ① PIN : RF INPUT
- ② VCC1 : 1st. DC SUPPLY
- ③ VCC2 : 2nd. DC SUPPLY
- ④ VCC3 : 3rd. DC SUPPLY
- ⑤ PIN : RF OUTPUT
- ⑥ GND : FIN

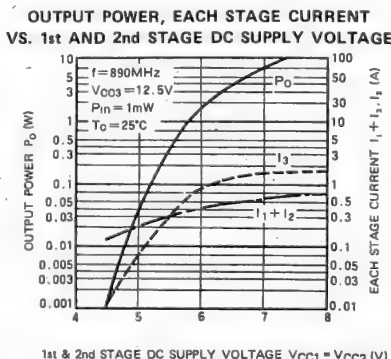
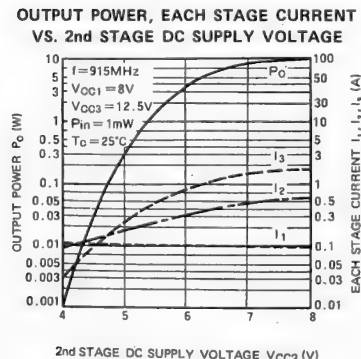
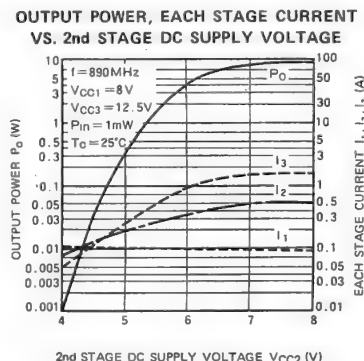
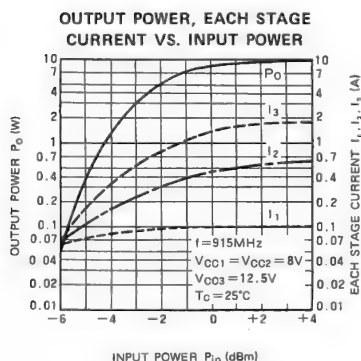
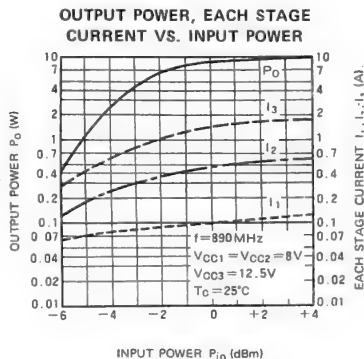
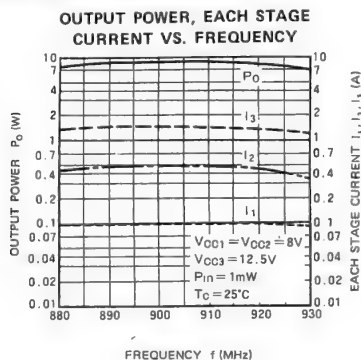
ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	1st. DC supply		9	V
Vcc2	2nd. DC supply		9	V
Vcc3	3rd. DC supply		17	V
Icc	Total current	Z ₀ = Z _L = 50 Ω	4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω, Vcc1 ≤ 8V	7	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
Tc(OP)	Operation case temperature		-30~110	°C
Tstg	Storage temperature		-40~110	°C

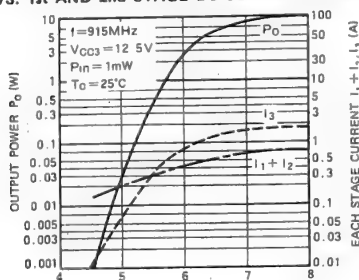
ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = 8V, Vcc3 = 12.5V P _{in} = 1mW Z ₀ = Z _L = 50 Ω	890	915	MHz
P _o	Output power		7		W
η _T	Total efficiency		35		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	—
—	Load VSWR tolerance	Vcc1 = Vcc2 = 8V, Vcc3 = 15.2V P _o = 7W (P _{in} : controlled), Z ₀ = 50 Ω Load VSWR=20:1 (All phase), 5sec.	No degradation		—

TYPICAL PERFORMANCE DATA



OUTPUT POWER, EACH STAGE CURRENT
VS. 1st AND 2nd STAGE DC SUPPLY VOLTAGE



1st & 2nd STAGE DC SUPPLY VOLTAGE $V_{CC1} = V_{CC2}$ (V)

DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to the following consideration when designing a heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistances between junction of incorporated transistors and case are shown in the followings.

- First stage transistor
 $R_{th(j-c)1} = 20^\circ\text{C/W}$ (Typ.)
- Second stage transistor
 $R_{th(j-c)2} = 17.5^\circ\text{C/W}$ (Typ.)
- Third stage transistor
 $R_{th(j-c)3} = 16^\circ\text{C/W}$ (Typ.)
- Fourth stage transistor
 $R_{th(j-c)4} = 9^\circ\text{C/W}$ (Typ.)
- Final stage transistor
 $R_{th(j-c)5} = 6.5^\circ\text{C/W}$ (Typ.)

- (2) V_{CC} , I_T , RF input & output power conditions at standard operation for each stage transistors are estimated as follows.

$P_O = 7\text{W}$, $V_{CC1} = V_{CC2} = 8\text{V}$, $V_{CC3} = 12.5\text{V}$, $P_{IN} = 1\text{mW}$, $\eta_T = 35\%$ (minimum ratings),
 $I_{1+2} = 0.781\text{A}$ (Total current from 1st stage to 4th stage)

$I_3 = 1.1\text{A}$ (Current of 5th stage)

The conditions at standard operation for each stage transistors are shown in Table 1.

- Junction temperature of the first stage transistor
 $T_{j1} = (V_{CC1} \times I_{T1} - P_{O1} + P_{IN}) \times R_{th(j-c)1} + T_C$ (Note 1)
 $= (8 \times 0.045 - 0.02 + 0.001) \times 20 + T_C$
 $= 6.8 + T_C$ ($^\circ\text{C}$)

Note 1: Case temperature of device

- Junction temperature of the second stage transistor
 $T_{j2} = (V_{CC1} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_C$
 $= (8 \times 0.08 - 0.2 + 0.02) \times 17.5 + T_C$

$$= 8.1 + T_C$$
 ($^\circ\text{C}$)

- Junction temperature of the third stage transistor
 $T_{j3} = (V_{CC2} \times I_{T3} - P_{O3} + P_{O2}) \times R_{th(j-c)3} + T_C$
 $= (8 \times 0.16 - 0.5 + 0.2) \times 16 + T_C$
 $= 15.7 + T_C$ ($^\circ\text{C}$)
- Junction temperature of the fourth stage transistor
 $T_{j4} = (V_{CC2} \times I_{T4} - P_{O4} + P_{O3}) \times R_{th(j-c)4} + T_C$
 $= (8 \times 0.496 - 2 + 0.5) \times 9 + T_C$
 $= 22.2 + T_C$ ($^\circ\text{C}$)
- Junction temperature of the final stage transistor
 $T_{j5} = (V_{CC3} \times I_{T5} - P_O + P_{O4}) \times R_{th(j-c)5} + T_C$
 $= (12.5 \times 1.1 - 7 + 2) \times 6.5 + T_C$
 $= 56.9 + T_C$ ($^\circ\text{C}$)

2. Heat sink design

In thermal design of heat sink, keep the case temperature below 90°C at output power $P_O = 7\text{W}$ and ambient temperature $= 60^\circ\text{C}$.

The thermal resistance $R_{th(c-a)}$ (Note 2) of the heat sink to realize this:

$$R_{th(c-a)} = \frac{T_C - T_a}{(P_O/\eta_T) - P_O + P_{IN}} = \frac{90 - 60}{(7/0.35 - 7 + 0.001)} = 2.31$$
 ($^\circ\text{C/W}$)

Note 2: Including the contact thermal resistance between device and heat sink

Mounting the device on the heat sink with above thermal resistance, junction temperatures of each transistor become:
 $T_{j1} = 97^\circ\text{C}$, $T_{j2} = 98^\circ\text{C}$, $T_{j3} = 106^\circ\text{C}$, $T_{j4} = 113^\circ\text{C}$,
 $T_{j5} = 147^\circ\text{C}$ at $T_a = 60^\circ\text{C}$, $T_C = 90^\circ\text{C}$.

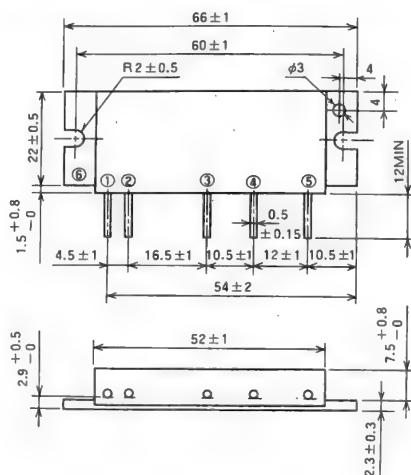
Since the annual average of ambient temperature is 30°C , junction temperatures of each transistor become:

$$T_{j1} = 67^\circ\text{C}, T_{j2} = 69^\circ\text{C}, T_{j3} = 76^\circ\text{C}, T_{j4} = 76^\circ\text{C}, T_{j5} = 117^\circ\text{C}$$

As the maximum junction temperature of these incorporated transistors $T_{j\text{max}}$ are 175°C , application under fully derated condition is ensured.

OUTLINE DRAWING

Dimensions in mm



H3

PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

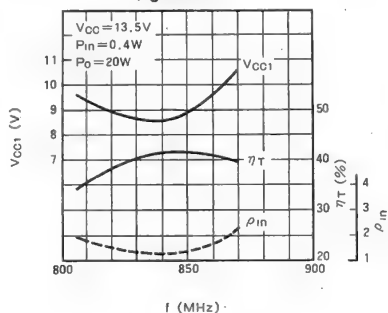
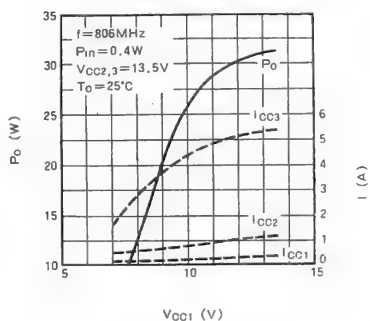
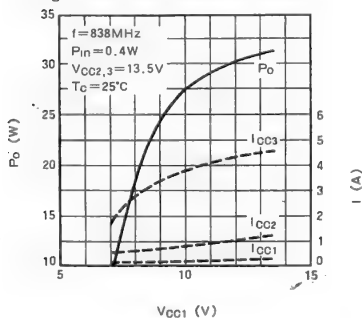
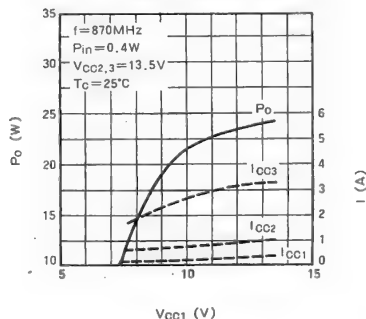
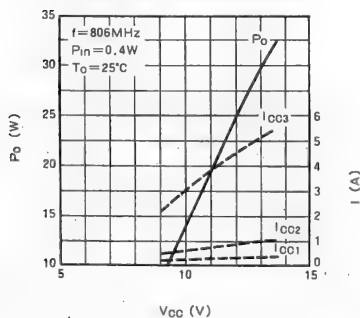
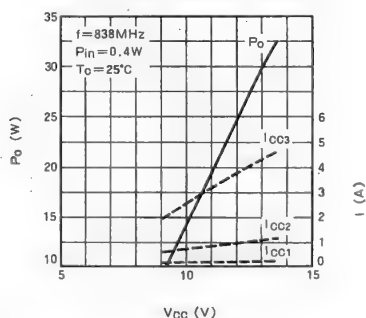
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	1st. DC supply		14	V
Vcc2	2nd. DC supply		17	V
Vcc3	3rd. DC supply		17	V
Icc	Total current	Zg = ZL = 50 Ω	7	A
Pin(max)	Input power	Zg = ZL = 50 Ω, Vcc1 ≤ 12.5V	0.8	W
Po(max)	Output power	Zg = ZL = 50 Ω	30	W
Tc(OP)	Operation case temperature	Zg = ZL = 50 Ω	-30~110	°C
Tstg	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

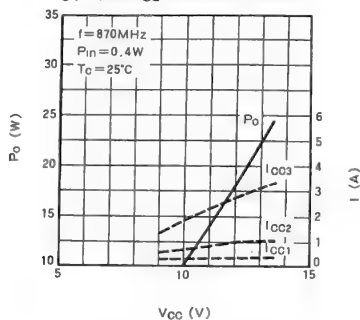
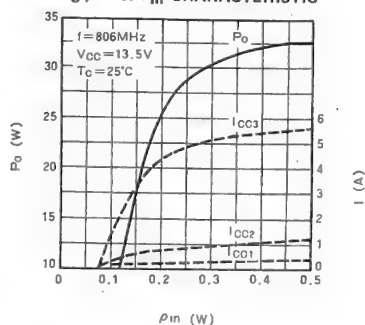
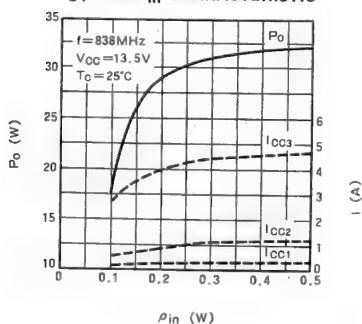
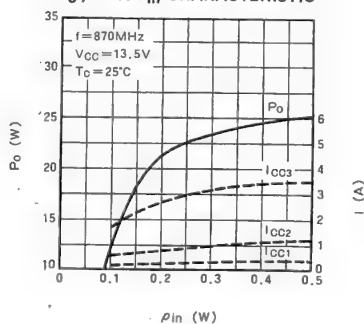
Symbol	Parameter	Test conditions	Limits		Unit
f	Frequency range	Vcc1 = Vcc2 = Vcc3 = 13.5V Pin = 0.4W Zg = ZL = 50 Ω	Min	Max	MHz
Po	Output power		806	870	
ηT	Total efficiency		20		W
2fo	2nd. harmonic		30		%
p _{in}	Input VSWR			-30	dB
				2.8	-
-	Load VSWR tolerance	Vcc1 = 13.5V, Vcc2 = Vcc3 = 15.5V Po = 20W (Pin: controlled), Zg = 50Ω Load VSWR=20:1 (All phase), 5sec.	No degradation		-

806-870MHz, 13.5V, 20W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

 V_{CC1} , η_T , ρ_{in} CHARACTERISTIC
(P_o 20W SET) P_o , I VS. V_{CC1} CHARACTERISTIC P_o , I VS. V_{CC1} CHARACTERISTIC P_o , I VS. V_{CC1} CHARACTERISTIC P_o , I VS. V_{CC} CHARACTERISTIC P_o , I VS. V_{CC} CHARACTERISTIC

806~870MHz, 13.5V, 20W, FM MOBILE RADIO

 P_o, I VS. V_{CC} CHARACTERISTIC P_o, I VS. P_{in} CHARACTERISTIC P_o, I VS. P_{in} CHARACTERISTIC P_o, I VS. P_{in} CHARACTERISTIC

DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.
 - a) First stage transistor
 $R_{th(j-c)1} = 15^{\circ}\text{C/W (Typ.)}$
 - b) Second stage transistor
 $R_{th(j-c)2} = 3^{\circ}\text{C/W (Typ.)}$
 - c) Final stage transistor
 $R_{th(j-c)3} = 1.87^{\circ}\text{C/W (Typ.)}$
- (2) Junction temperature of incorporated transistors at standard operation.

• Conditions for standard operation.

$P_O = 20\text{W}$, $V_{CC} = 13.5\text{V}$, $P_{IN} = 0.4\text{W}$, $\eta_T = 30\%$ (minimum rating), P_{O1} (Note 1) = 3W , P_{O2} (2) = 10W , $I_T = 4.9\text{A}$ (I_{T1} (3) = 0.4A , I_{T2} (4) = 1.4A , I_{T3} (5) = 3.1A)

Note 1: Output power of the first stage transistor

Note 2: Output power of the second stage transistor

Note 3: Circuit current of the first stage transistor

Note 4: Circuit current of the second stage transistor

Note 5: Circuit current of the final stage transistor

• Junction temperature of the first stage transistor

$$T_{j1} = (V_{CC} \times I_{T1} - P_{O1} + P_{IN}) \times R_{th(j-c)1} + T_C^{(6)}$$

$$= (13.5 \times 0.4 - 3 + 0.4) \times 15 + T_C$$

$$= 42 + T_C (^{\circ}\text{C})$$

Note 6: Package temperature of device

• Junction temperature of the second stage transistor

$$T_{j2} = V_{CC} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_C$$

$$= (13.5 \times 1.4 - 10 + 3) \times 3 + T_C$$

$$= 35.7 + T_C (^{\circ}\text{C})$$

• Junction temperature of the final stage transistor

$$T_{j3} = (V_{CC} \times I_{T3} - P_O + P_{O2}) \times R_{th(j-c)3} + T_C$$

$$= (13.5 \times 3.1 - 20 + 10) \times 1.87 + T_C$$

$$= 59.6 + T_C (^{\circ}\text{C})$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 20W below 90°C .

The thermal resistance $R_{th(c-a)}$ (7) of the heat sink to realize this:

$$R_{th(c-a)} = \frac{T_C - T_a}{(P_O/\eta_T) - P_O + P_{IN}} = \frac{90 - 60}{(20/0.3) - 20 + 0.4}$$

$$= 0.637 (^{\circ}\text{C/W})$$

Note 7: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device,

$$T_{j1} = 132^{\circ}\text{C}, T_{j2} = 125.7^{\circ}\text{C}, T_{j3} = 149.6^{\circ}\text{C at } T_a = 60^{\circ}\text{C}, T_C = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 102^{\circ}\text{C}, T_{j2} = 95.7^{\circ}\text{C}, T_{j3} = 119.6^{\circ}\text{C}.$$

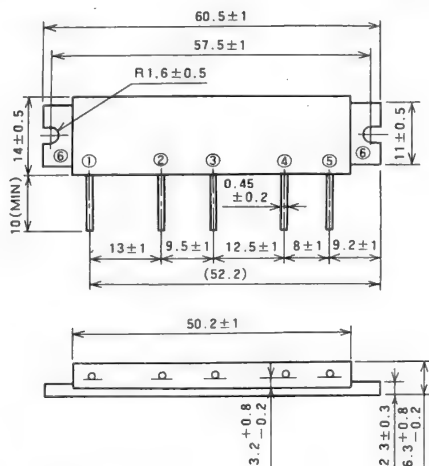
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

M57793

903~905MHz, 12.5V, 7W, FM MOBILE RADIO

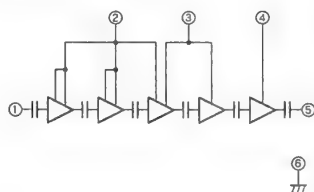
OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

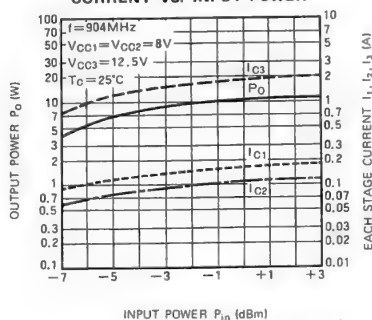
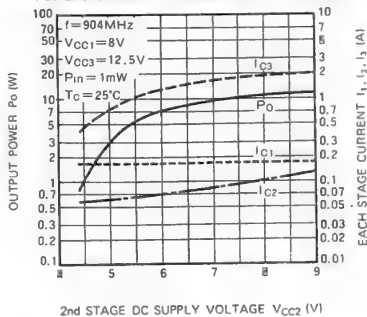
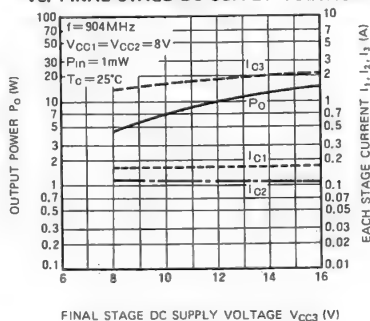
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	1st. DC supply		9	V
Vcc2	2nd. DC supply		9	V
Vcc3	3rd. DC supply		17	V
Icc	Total current	Z _g = Z _L = 50 Ω	4	A
P _{in(max)}	Input power	Z _g = Z _L = 50 Ω, Vcc1 ≤ 8V	7	mW
P _{O(max)}	Output power	Z _g = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		903	905	MHz
P _o	Output power	Vcc1 = Vcc2 = 8V, Vcc3 = 12.5V	7		W
η _T	Total efficiency	P _{in} = 1mW	35		%
2f _o	2nd. harmonic	Z _g = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.8	—
—	Load VSWR tolerance	Vcc1 = Vcc2 = 8V, Vcc3 = 15.2V P _o = 7W (P _{in} : controlled), Z _o = 50Ω Load VSWR=20:1 (All phase), 5sec.	No degradation		—

903~905MHz, 12.5V, 7W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

OUTPUT POWER, EACH STAGE
CURRENT VS. INPUT POWEROUTPUT POWER, EACH STAGE CURRENT
VS. 2nd STAGE DC SUPPLY VOLTAGEOUTPUT POWER, EACH STAGE CURRENT
VS. FINAL STAGE DC SUPPLY VOLTAGE

APC Method

For Automatic Power Control (APC), we recommend the method by V_{CC2} control.

Please regulate each stage supply voltage and input power as followings:

Symbol	Center value	Allowable changing value
P_{in}	1mW	0.7 ~ 3mW
V_{CC1}	8V	7 ~ 8.5V
V_{CC2}	3 ~ 8V	—
V_{CC3}	13.5V	12.5V ~ 13.8V

DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to the following consideration when designing a heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistances between junction of incorporated transistors and case are shown in the followings.

- a) First stage transistor

$$R_{th(j-c)1} = 20^{\circ}\text{C/W (Typ.)}$$

- b) Second stage transistor

$$R_{th(j-c)2} = 17.5^{\circ}\text{C/W (Typ.)}$$

- c) Third stage transistor

$$R_{th(j-c)3} = 16^{\circ}\text{C/W (Typ.)}$$

- d) Fourth stage transistor

$$R_{th(j-c)4} = 9^{\circ}\text{C/W (Typ.)}$$

- e) Final stage transistor

$$R_{th(j-c)5} = 6.5^{\circ}\text{C/W (Typ.)}$$

- (2) V_{CC} , I_T , RF input & output power conditions at standard operation for each stage transistors are estimated as follows.

$P_O = 7\text{W}$, $V_{CC1} = V_{CC2} = 8\text{V}$, $V_{CC3} = 12.5\text{V}$, $P_{In} = 1\text{mW}$, $\eta_T = 35\%$ (minimum ratings),

$I_{1+2} = 0.781\text{A}$ (Total current from 1st stage to 4th stage)

$I_3 = 1.43\text{A}$ (Current of 5th stage)

The conditions at standard operation for each stage transistors are shown in Table 1.

Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC1} \times I_{T1} - P_{O1} + P_{In}) \times R_{th(j-c)1} + T_C \text{ (Note 1)} \\ &= (8 \times 0.05 - 0 + 0.001) \times 20 + T_C \\ &= 7.6 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

Note 1: Case temperature of device

Junction temperature of the second stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC1} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_C \\ &= (8 \times 0.09 - 0.2 + 0.02) \times 17.5 + T_C \\ &= 9.5 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

Junction temperature of the third stage transistor

$$\begin{aligned} T_{j3} &= (V_{CC2} \times I_{T3} - P_{O3} + P_{O2}) \times R_{th(j-c)3} + T_C \\ &= (8 \times 0.12 - 0.5 + 0.2) \times 16 + T_C \\ &= 11.6 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

Junction temperature of the fourth stage transistor

$$\begin{aligned} T_{j4} &= (V_{CC2} \times I_{T4} - P_{O4} + P_{O3}) \times R_{th(j-c)4} + T_C \\ &= (12.5 \times 0.43 - 2 + 0.5) \times 9 + T_C \\ &= 34.9 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

Junction temperature of the final stage transistor

$$\begin{aligned} T_{j5} &= (V_{CC3} \times I_{T5} - P_{O5} + P_{O4}) \times R_{th(j-c)5} + T_C \\ &= (12.5 \times 1.0 - 7 + 2) \times 6.5 + T_C \\ &= 48.8 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, keep the case temperature below 90°C at output power $P_O = 7\text{W}$ and ambient temperature $= 60^{\circ}\text{C}$.

Table 1: The conditions at standard operation

Stage	V_{CC} (V)	I_T (mA)	P_{In} (mW)	P_O (mW)
1st	8	50	1	20
2nd	8	90	20	200
3rd	8	120	200	500
4th	8	430	500	2000
5th	12.5	1000	2000	7000

The thermal resistance $R_{th(c-a)}$ (Note 2) of the heat sink to realize this:

$$\begin{aligned} R_{th(c-a)} &= \frac{T_C - T_a}{(P_O/\eta_T) - P_O + P_{In}} = \frac{90 - 60}{(7/0.35 - 7 + 0.001)} \\ &= 2.31^{\circ}\text{C/W} \end{aligned}$$

Note 2: Including the contact thermal resistance between device and heat sink

Mounting the device on the heat sink with above thermal resistance, junction temperatures of each transistor become;

$$\begin{aligned} T_{j1} &= 98^{\circ}\text{C}, T_{j2} = 100^{\circ}\text{C}, T_{j3} = 102^{\circ}\text{C}, T_{j4} = 125^{\circ}\text{C}, \\ T_{j5} &= 139^{\circ}\text{C at } T_a = 60^{\circ}\text{C}, T_C = 90^{\circ}\text{C}. \end{aligned}$$

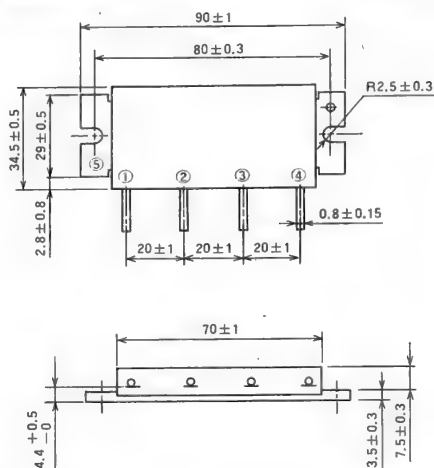
Since the annual average of ambient temperature is 30°C , junction temperatures of each transistor become;

$$\begin{aligned} T_{j1} &= 68^{\circ}\text{C}, T_{j2} = 70^{\circ}\text{C}, T_{j3} = 72^{\circ}\text{C}, T_{j4} = 95^{\circ}\text{C}, \\ T_{j5} &= 109^{\circ}\text{C} \end{aligned}$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

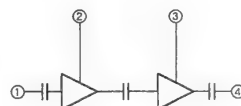
OUTLINE DRAWING

Dimensions in mm



H17

BLOCK DIAGRAM



PIN :

① Pin : RF INPUT

② Vcc1 : 1st. DC SUPPLY

③ Vcc2 : 2nd. DC SUPPLY

④ Po : RF OUTPUT

⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		25	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	10	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	90	W
T _{c(OP)}	Operation case temperature		-30~110	$^\circ\text{C}$
T _{stg}	Storage temperature		-40~110	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

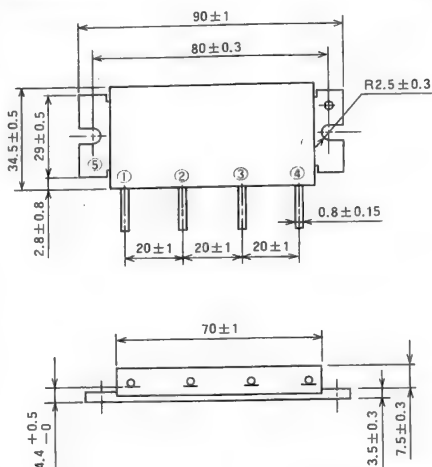
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		150	175	MHz
P _o	Output power		60		W
η_T	Total efficiency	P _{in} = 5W	40		%
2f _o	2nd. harmonic	Vcc = 12.5V		-30	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		-35	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V P _o = 60W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

M67703M

430~450MHz, 12.5V, 45-50W, FM MOBILE RADIO

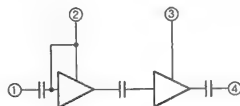
OUTLINE DRAWING

Dimensions in mm



H17

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Po : RF OUTPUT
- ⑤GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		25	A
P _{in(max)}	Input power	$Z_G = Z_L = 50 \Omega$	18	W
P _{o(max)}	Output power	$Z_G = Z_L = 50 \Omega$	80	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

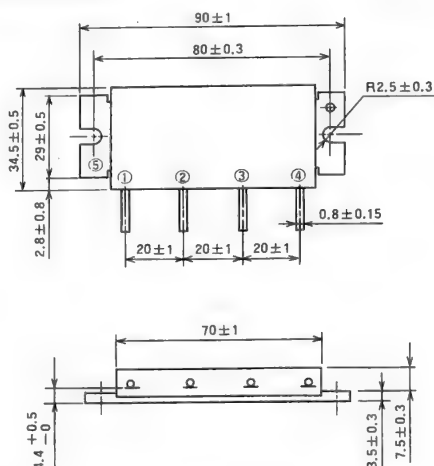
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		430	450	MHz
P _o	Output power	P _{in} = 10W	50		W
η_T	Total efficiency	Vcc = 12.5V	40		%
2f _o	2nd. harmonic	$Z_G = Z_L = 50 \Omega$		-30	dB
3f _o	3rd. harmonic			-35	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V P _o = 50W (P _{in} : controlled) Load VSWR=8.8:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

M67703H

450~470MHz, 12.5V, 45-50W, FM MOBILE RADIO

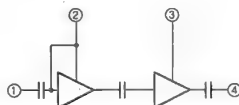
OUTLINE DRAWING

Dimensions in mm



H17

BLOCK DIAGRAM



PIN :

- ① P_{in} : RF INPUT
- ② V_{CC1} : 1st. DC SUPPLY
- ③ V_{CC2} : 2nd. DC SUPPLY
- ④ P_o : RF OUTPUT
- ⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		17	V
I_{CC}	Total current		25	A
$P_{in(max)}$	Input power	$Z_G = Z_L = 50 \Omega$	18	W
$P_{o(max)}$	Output power	$Z_G = Z_L = 50 \Omega$	80	W
$T_{C(OP)}$	Operation case temperature		-30~110	$^\circ\text{C}$
T_{stg}	Storage temperature		-40~110	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

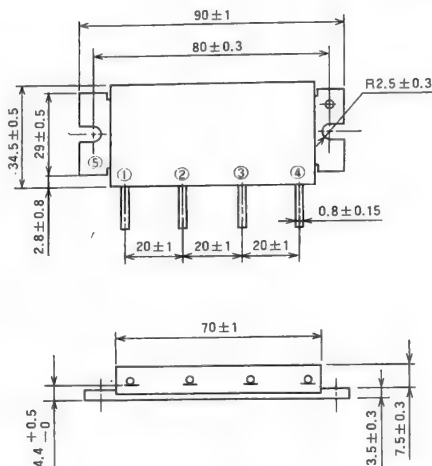
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 10\text{W}$ $V_{CC} = 12.5\text{V}$ $Z_G = Z_L = 50 \Omega$	450	470	MHz
P_o	Output power		50		W
η_T	Total efficiency		40		%
$2f_o$	2nd. harmonic			-30	dB
$3f_o$	3rd. harmonic			-35	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{CC} = 15.2\text{V}$ $P_o = 50\text{W}$ (P_{in} : controlled) Load VSWR=8:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

M67703UH

470~490MHz, 12.5V, 45-50W, FM MOBILE RADIO

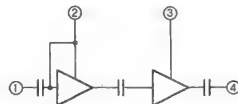
OUTLINE DRAWING

Dimensions in mm



H17

BLOCK DIAGRAM



PIN :

①P_{in} : RF INPUT②V_{cc1} : 1st. DC SUPPLY③V_{cc2} : 2nd. DC SUPPLY④P_o : RF OUTPUT

⑤GND : PIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		25	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	18	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	80	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

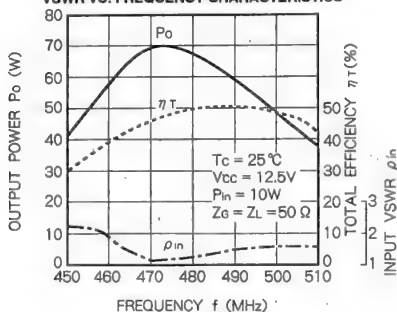
ELECTRICAL CHARACTERISTICS (T_o = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 10W V _{cc} = 12.5V Z ₀ = Z _L = 50 Ω	470	490	MHz
P _o	Output power		50		W
η _T	Total efficiency		40		%
2f ₀	2nd. harmonic			-30	dB
3f ₀	3rd. harmonic			-35	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V P _o = 50W (P _{in} : controlled) Load VSWR=8.8:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

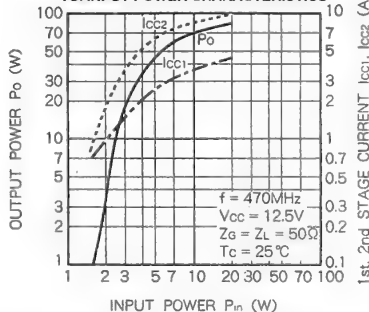
470~490MHz, 12.5V, 45-50W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

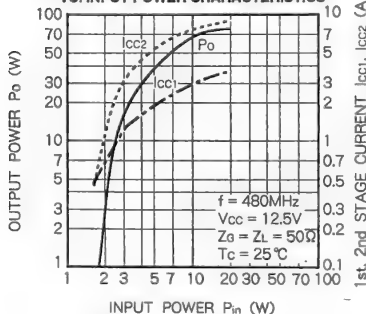
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



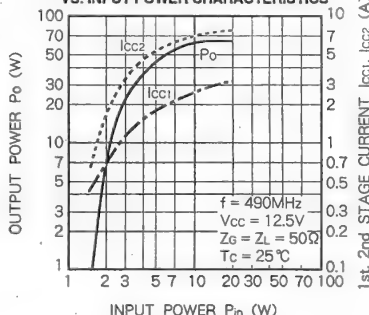
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



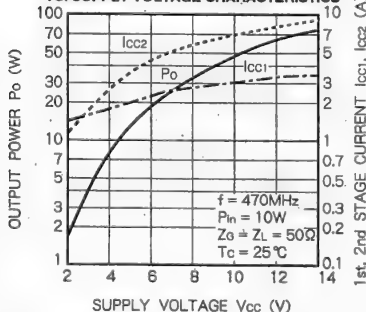
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



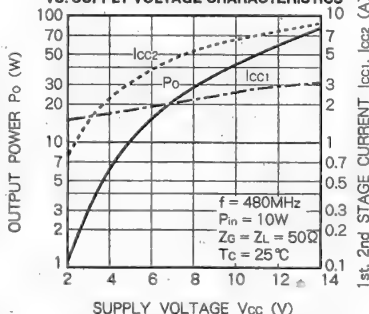
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. INPUT POWER CHARACTERISTICS

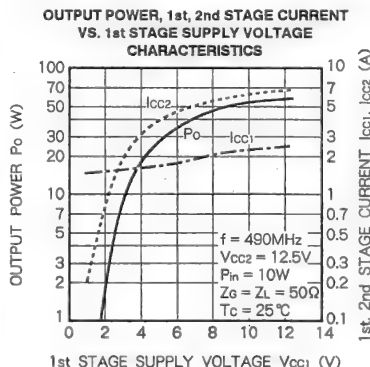
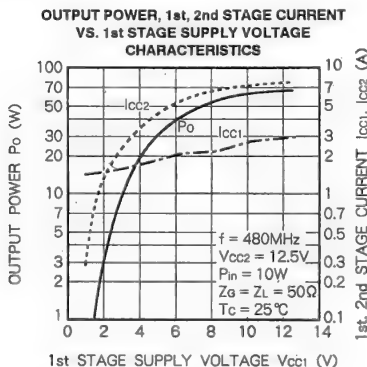
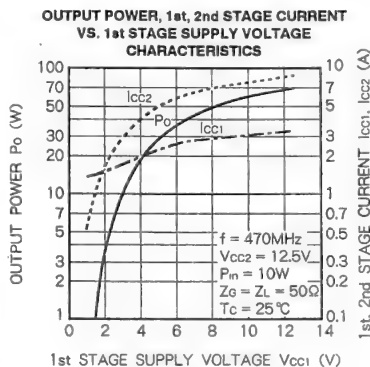
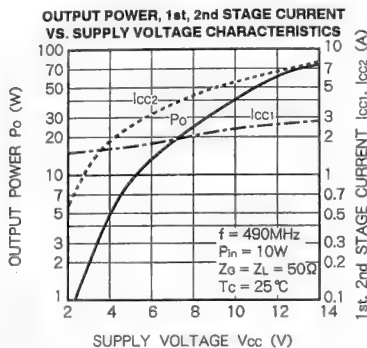


OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS



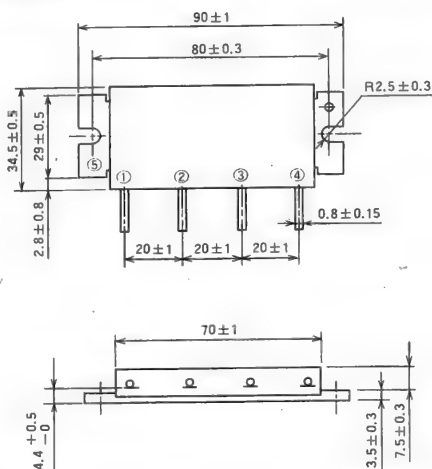


M67703SH

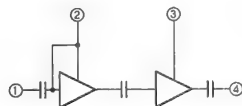
490~512MHz, 12.5V, 45~50W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②VCC1 : 1st. DC SUPPLY
- ③VCC2 : 2nd. DC SUPPLY
- ④Po : RF OUTPUT
- ⑤GND : PIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		25	A
P _{in(max)}	Input power	Z _g = Z _L = 50 Ω	18	W
P _{o(max)}	Output power	Z _g = Z _L = 50 Ω	80	W
T _{c(OP)}	Operation case temperature		-30~110	$^\circ\text{C}$
T _{stg}	Storage temperature		-40~110	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

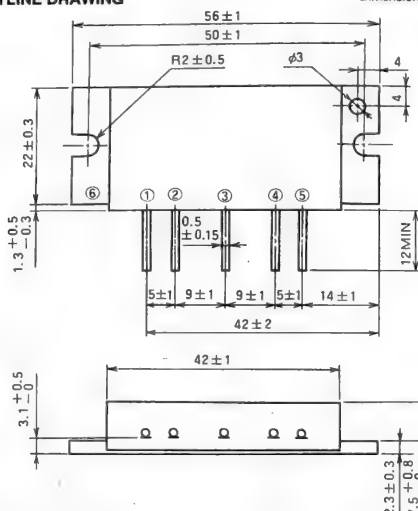
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		490	512	MHz
P _o	Output power	P _{in} = 10W	50		W
η_T	Total efficiency	Vcc = 12.5V	40		%
2f _o	2nd. harmonic	Z _g = Z _L = 50 Ω		-30	dB
3f _o	3rd. harmonic			-35	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V P _o = 50W (P _{in} : controlled) Load VSWR=8:1 (All phase), 2sec. Z _g = 50 Ω	No degradation		-

M67704

142~175MHz, 12.5V, 13W, FM MOBILE RADIO

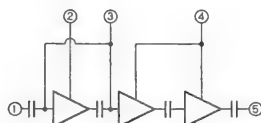
OUTLINE DRAWING

Dimensions in mm



H16

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② VCC1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS
- ④ VCC2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

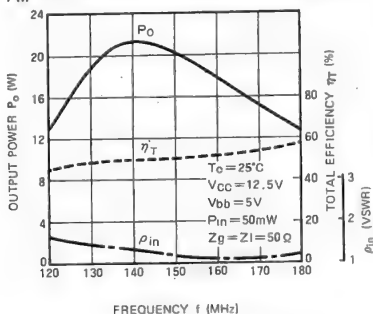
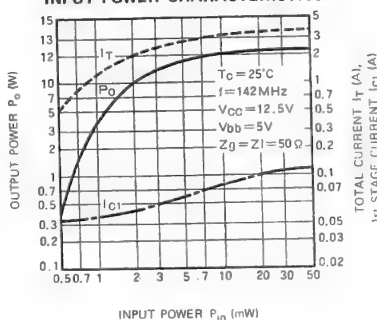
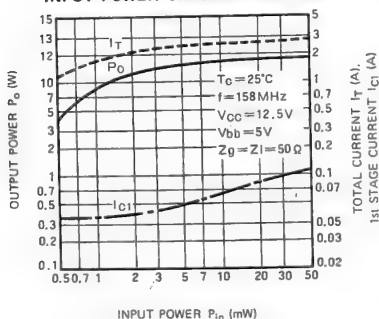
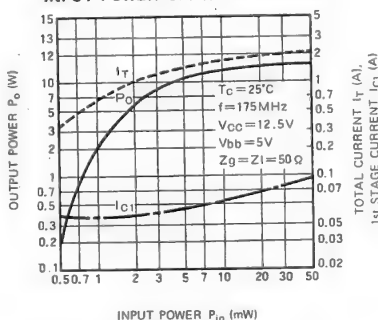
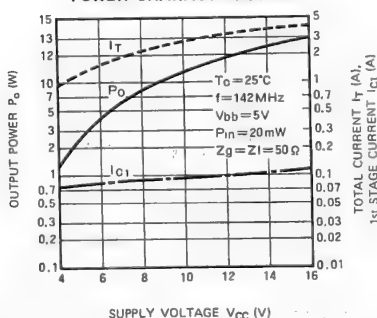
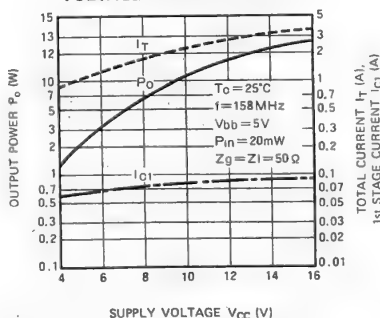
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		16	V
V _{bb}			6	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		142	175	MHz
P _o	Output power	P _{in} = 20mW	13		W
η _T	Total efficiency	V _{bb} = 5V	40		%
2f _o	2nd. harmonic	V _{cc} = 12.5V		-20	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	V _{cc} = 15.2V, V _{bb} = 5V P _o = 13W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50Ω	No degradation		—

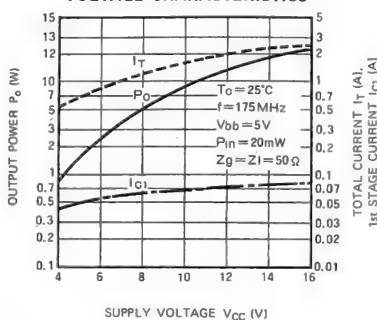
142~175MHz, 12.5V, 13W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

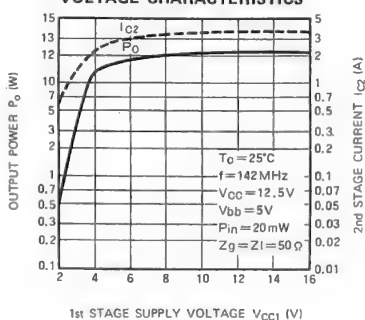
OUTPUT POWER, TOTAL EFFICIENCY,
 ρ_{in} VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS

142~175MHz, 12.5V, 13W, FM MOBILE RADIO

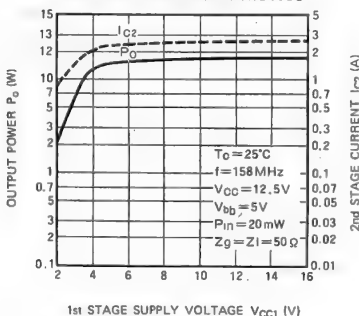
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



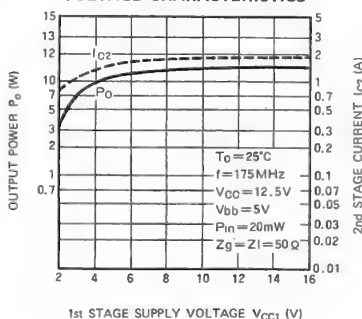
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



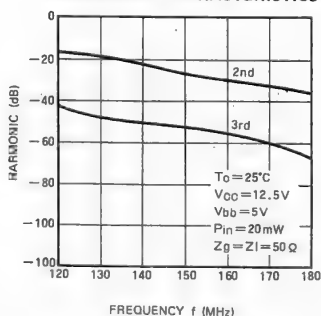
OUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



2nd, 3rd HARMONIC VS.
FREQUENCY CHARACTERISTICS

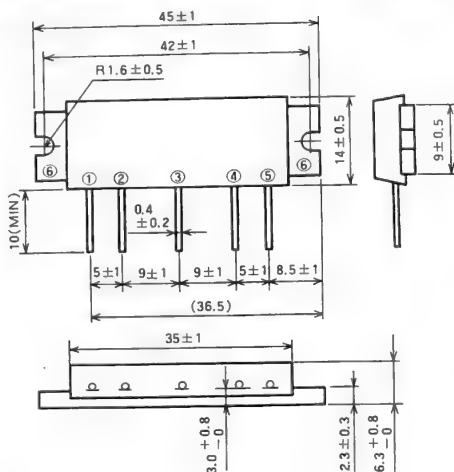


M67705UL

380~400MHz, 9.6V, 7W, FM PORTABLE RADIO

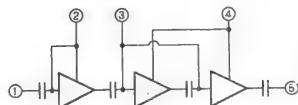
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③VBB : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

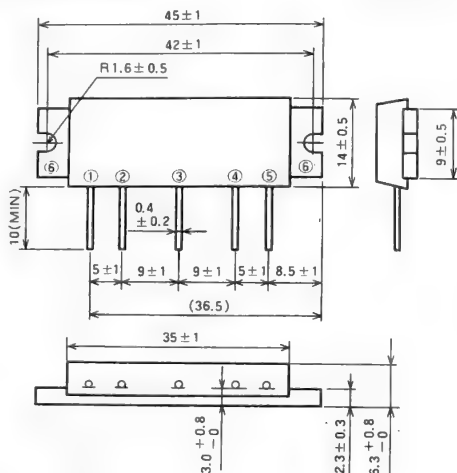
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	$V_{BB} \leq 5V$	13	V
Vbb		$V_{CC} \leq 9.6V$	6	V
Icc	Total current		4	A
P _{in(max)}	Input power	$Z_G = Z_L = 50 \Omega$	40	mW
P _{o(max)}	Output power	$Z_G = Z_L = 50 \Omega$	10	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 20\text{mW}$ $V_{BB} = 5V$ $V_{CC} = 9.6V$ $Z_G = Z_L = 50 \Omega$	380	400	MHz
P _o	Output power		7		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			-25	dB
3fo	3rd. harmonic			-30	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	$V_{CC} = 9.6V, V_{BB} = 5V$ $P_o = 7W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

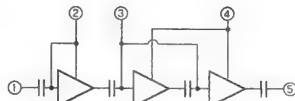
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ V_{BB} : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

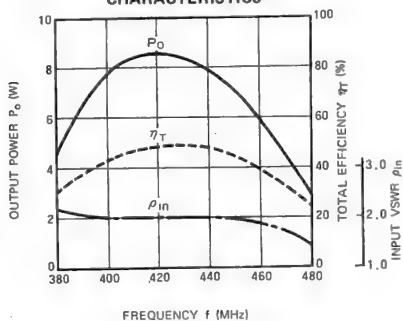
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage	V _{BB} ≤ 5V	13	V
V _{BB}		V _{cc} ≤ 9.6V	6	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

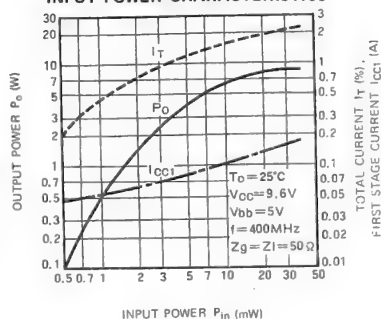
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		400	430	MHz
P _o	Output power	P _{in} = 20mW	7		W
η _T	Total efficiency	V _{BB} = 5V	40		%
2f _o	2nd. harmonic	V _{cc} = 9.6V		-25	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{cc} = 9.6V, V _{BB} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

400~430MHz, 9.6V, 7W, FM PORTABLE RADIO

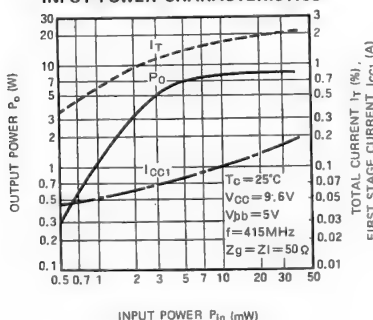
TYPICAL PERFORMANCE DATA OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



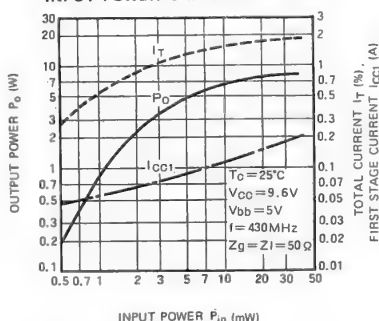
OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



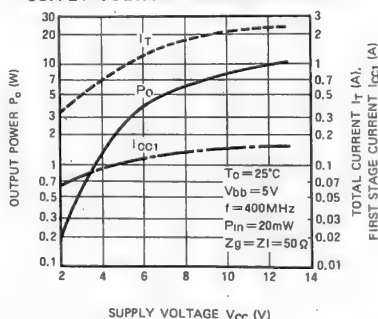
OUTPUT POWER, TOTAL CURRENT FIRST STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



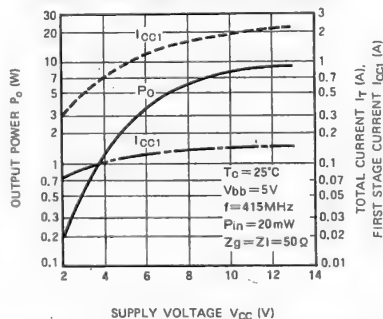
OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



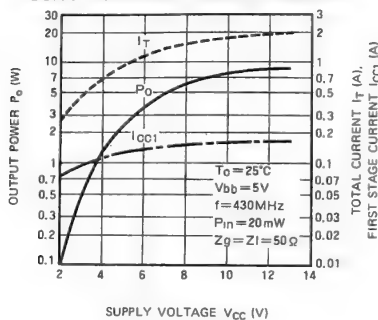
OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS



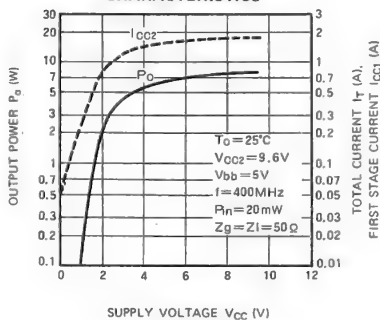
OUTPUT POWER, TOTAL CURRENT, FIRST STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS



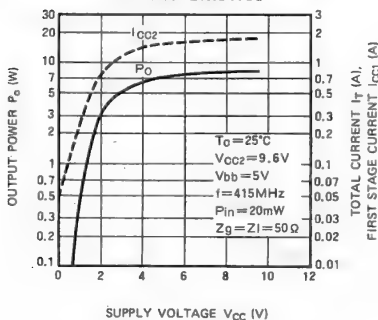
OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



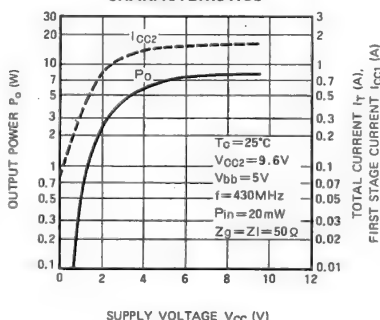
OUTPUT POWER, FINAL CURRENT
VS. FIRST STAGE SUPPLY
CHARACTERISTICS



OUTPUT POWER, FIRST STAGE CURRENT
VS. FIRST STAGE SUPPLY VOLTAGE
CHARACTERISTICS



OUTPUT POWER, FIANL STAGE CURRENT
VS. FIRST STAGE SUPPLY VOLTAGE
CHARACTERISTICS

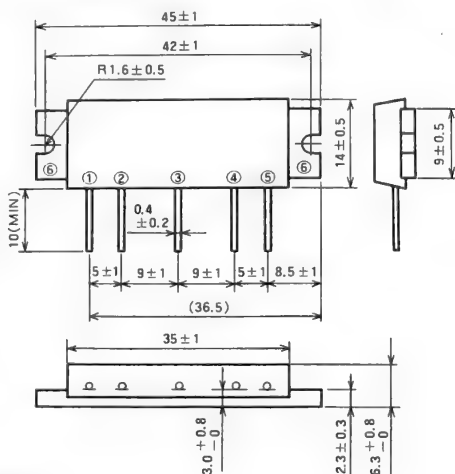


M67705M

430~470MHz, 9.6V, 7W, FM PORTABLE RADIO

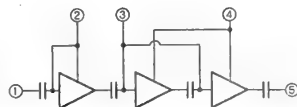
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vbb : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

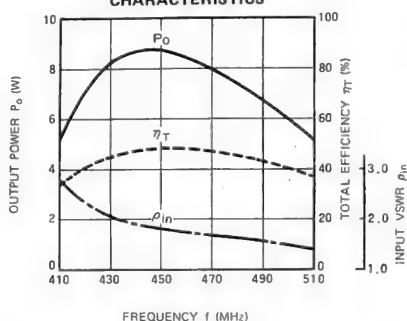
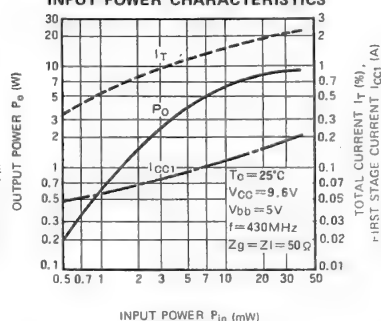
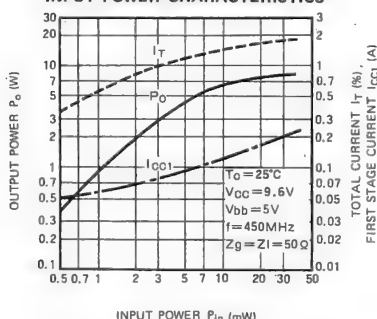
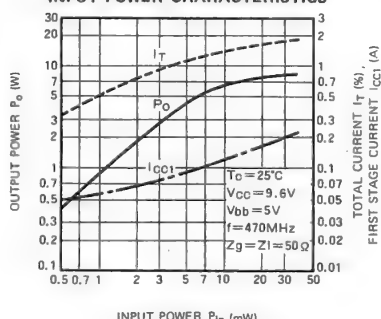
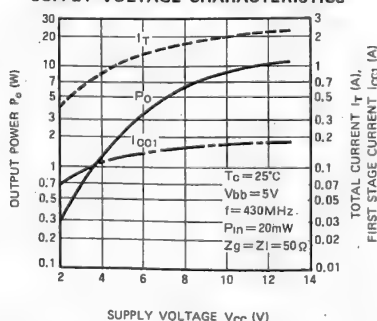
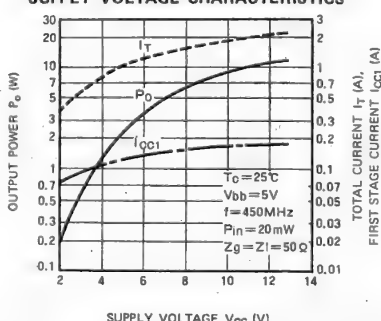
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage	V _{bb} ≤ 5V	13	V
V _{bb}		V _{cc} ≤ 9.6V	6	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		430	470	MHz
P _o	Output power	P _{in} = 20mW	7		W
η _T	Total efficiency	V _{bb} = 5V	40		%
2f ₀	2nd. harmonic	V _{cc} = 9.6V		-25	dB
3f ₀	3rd. harmonic	Z ₀ = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{cc} = 9.6V, V _{bb} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

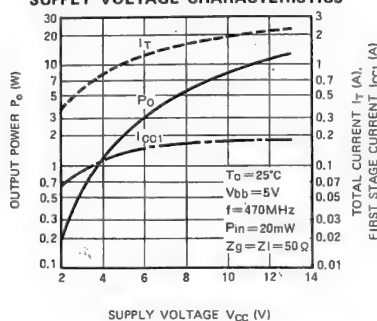
430~470MHz, 9.6V, 7W, FM PORTABLE RADIO

TYPICAL PERFORMANCE DATA

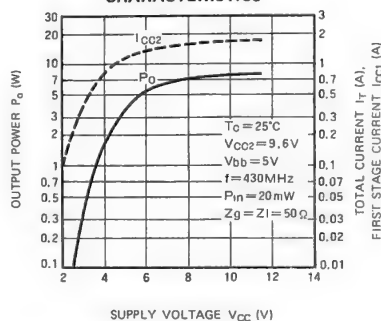
OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY
CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS

430~470MHz, 9.6V, 7W, FM PORTABLE RADIO

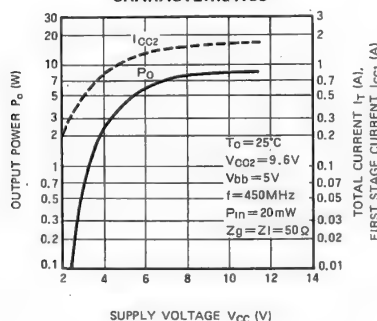
OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



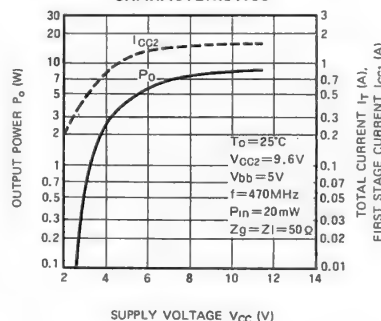
OUTPUT POWER, FINAL CURRENT
VS. FIRST STAGE SUPPLY
CHARACTERISTICS



OUTPUT POWER, FIRST STAGE CURRENT
VS. FIRST STAGE SUPPLY VOLTAGE
CHARACTERISTICS



OUTPUT POWER, FINAL STAGE CURRENT
VS. FIRST STAGE SUPPLY VOLTAGE
CHARACTERISTICS

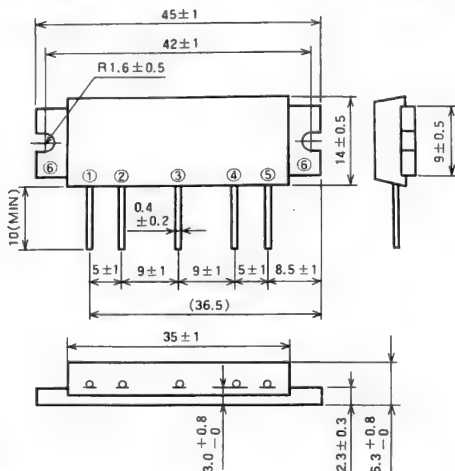


M67705H

470~512MHz, 9.6V, 7W, FM PORTABLE RADIO

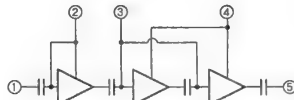
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN:

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

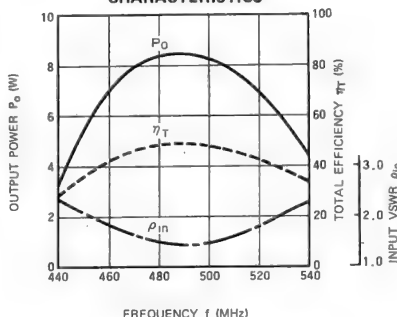
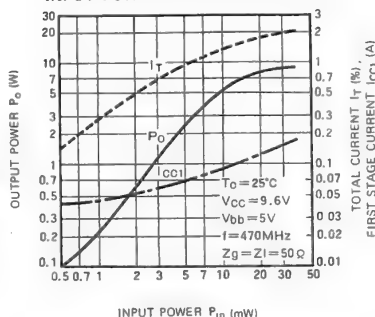
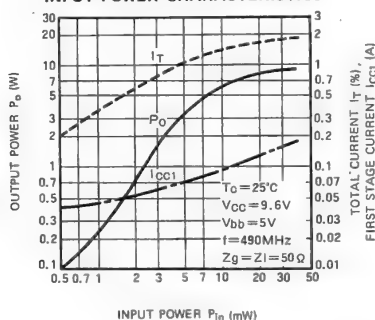
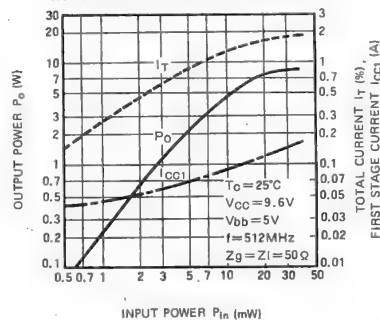
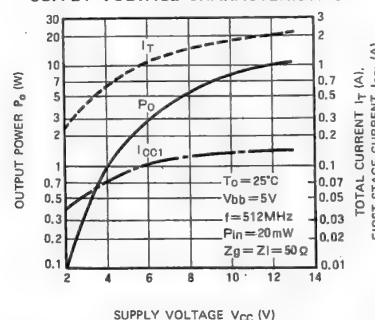
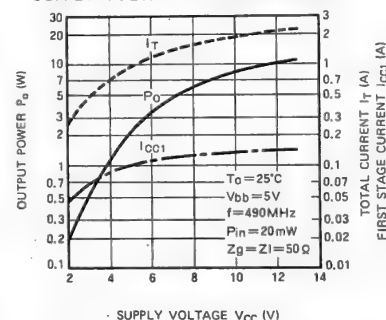
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	$V_{bb} \leq 5V$	13	V
Vbb		$V_{cc} \leq 9.6V$	6	V
Icc	Total current		4	A
P _{in(max)}	Input power	$Z_G = Z_L = 50 \Omega$	40	mW
P _{o(max)}	Output power	$Z_G = Z_L = 50 \Omega$	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

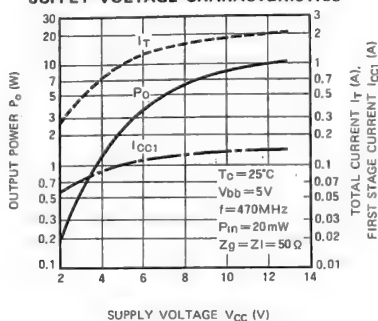
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		470	512	MHz
P _o	Output power	P _{in} = 20mW	7		W
η_T	Total efficiency	V _{bb} = 5V.	40		%
2f _o	2nd. harmonic	V _{cc} = 9.6V		-25	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{cc} = 9.6V, V _{bb} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

470-512MHz, 9.6V, 7W, FM PORTABLE RADIO

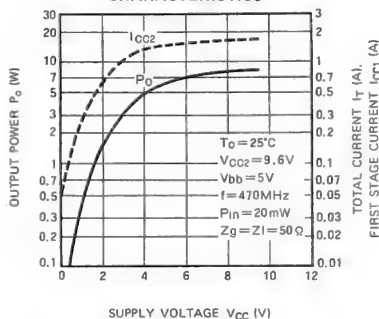
TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY
CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS

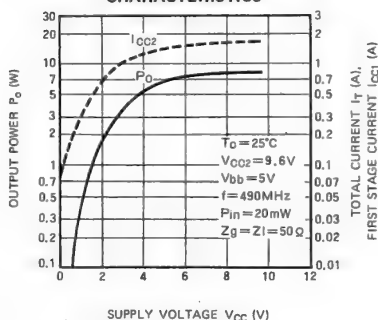
OUTPUT POWER, TOTAL CURRENT,
FIRST STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



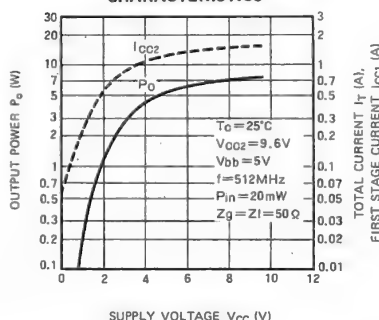
OUTPUT POWER, FINAL CURRENT
VS. FIRST STAGE SUPPLY
CHARACTERISTICS



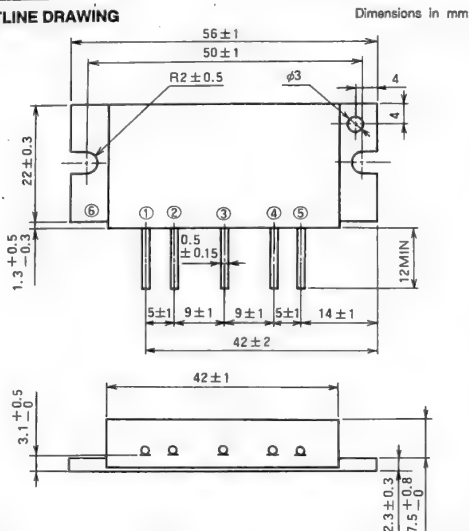
OUTPUT POWER, FIRST STAGE CURRENT
VS. FIRST STAGE SUPPLY VOLTAGE
CHARACTERISTICS



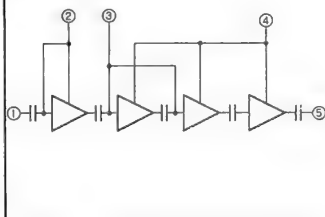
OUTPUT POWER, FINAL STAGE CURRENT
VS. FIRST STAGE SUPPLY VOLTAGE
CHARACTERISTICS



OUTLINE DRAWING



BLOCK DIAGRAM



PIN :

①Pin : RF INPUT

②Vcc1 : 1st. DC SUPPLY

③ V_{BB} : BASE BIAS

③ VCC2 : 2nd. DC SUPPLY

⑤ P₀ : RF OUTPUT

⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

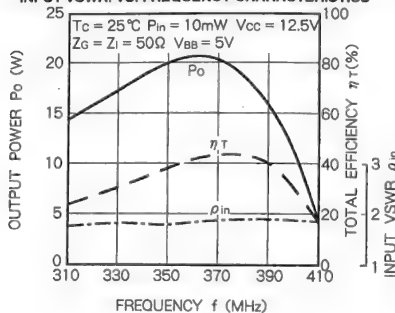
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage	V _{BE} ≤ 5V	16	V
V _{BE}		V _{CC} ≤ 12.5V	6	V
I _{CC}	Total current		5	A
P _{in(max)}	Input power	Z _θ = Z _L = 50 Ω	20	mW
P _{o(max)}	Output power	Z _θ = Z _L = 50 Ω	20	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

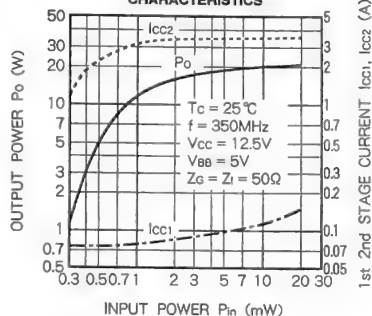
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 10\text{mW}$ $V_{CC1, 2} = 12.5\text{V}$ $V_{BB} = 5\text{V}$ $Z_G = Z_L = 50\ \Omega$	350	390	MHz
P_o	Output power		13		W
η_T	Total efficiency		35		%
2fo	2nd. harmonic			- 30	dB
3fo	3rd. harmonic			- 35	
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{CC1} = 12.5\text{V}$, $V_{CC2} = 15.2\text{V}$, $V_{BB} = 5\text{V}$ $P_O = 13\text{W}$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50\Omega$	No degradation		-

TYPICAL PERFORMANCE DATA

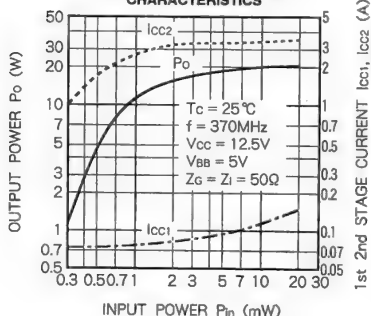
OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR, VS. FREQUENCY CHARACTERISTICS



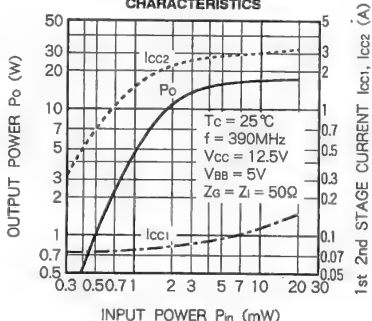
OUTPUT POWER, 1st, 2nd STAGE
CURRENT VS. INPUT POWER
CHARACTERISTICS



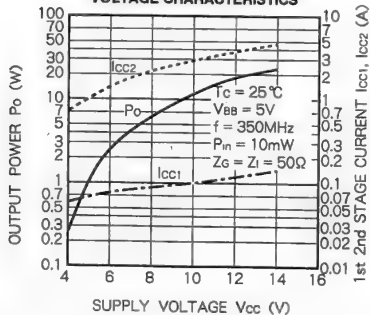
OUTPUT POWER, 1st, 2nd STAGE
CURRENT VS. INPUT POWER
CHARACTERISTICS



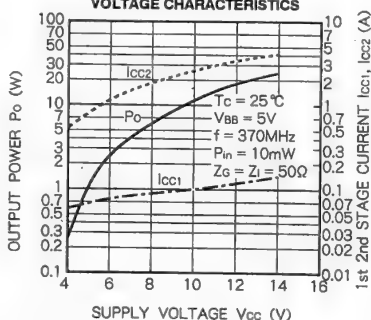
OUTPUT POWER, 1st, 2nd STAGE
CURRENT VS. INPUT POWER
CHARACTERISTICS



OUTPUT POWER, 1st, 2nd STAGE
CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS

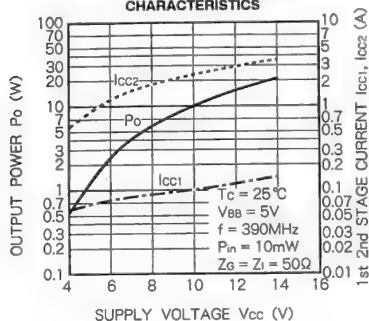


OUTPUT POWER, 1st, 2nd STAGE
CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS

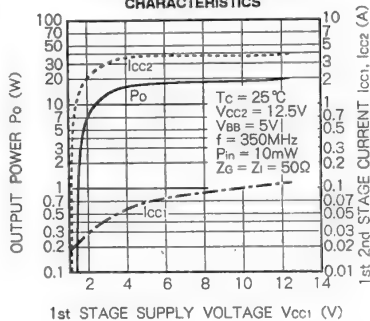


350-390MHz, 12.5V, 13W, FM MOBILE RADIO

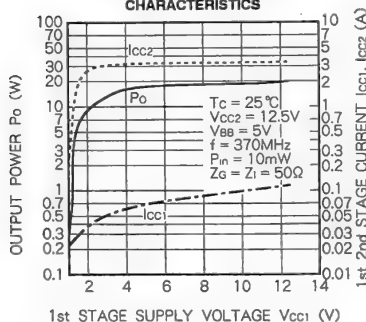
OUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. SUPPLY VOLTAGE
CHARACTERISTICS



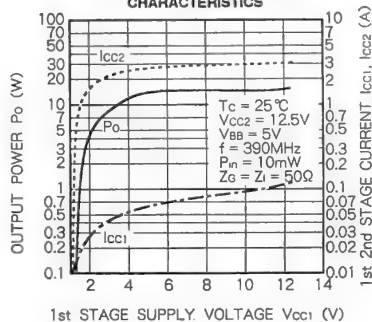
OUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS



OUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS

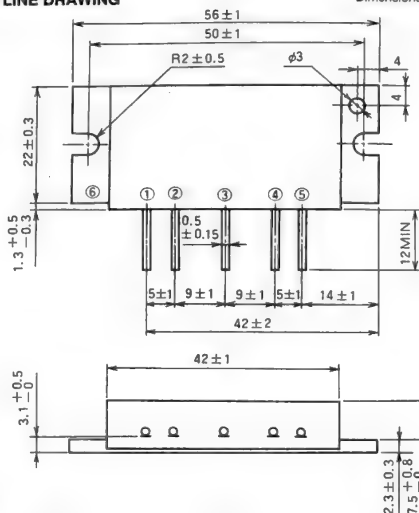


OUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS



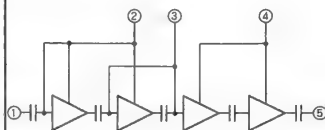
OUTLINE DRAWING

Dimensions in mm



H16

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③VBB : BASE BIAS
④Vcc2 : 2nd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

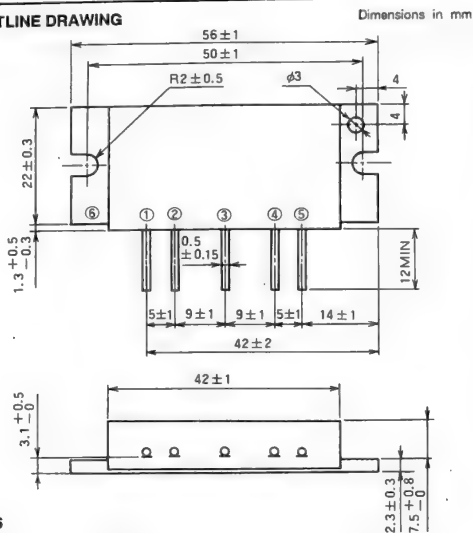
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage	V _{BB} ≤ 5V	16	V
V _{BB}		V _{CC} ≤ 12.5V	6	V
I _{CC}	Total current		5	A
P _{in(max)}	Input power	Z _θ = Z _L = 50 Ω	20	mW
P _{o(max)}	Output power	Z _θ = Z _L = 50 Ω	20	W
T _{c(OP)}	Operation case temperature		−30~110	°C
T _{stg}	Storage temperature		−40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 10\text{mW}$ $V_{cc1}, 2 = 12.5\text{V}$ $V_{BB} = 5\text{V}$ $Z_G = Z_L = 50\ \Omega$	430	470	MHz
Po	Output power		13		W
η_T	Total efficiency		35		%
2fo	2nd. harmonic			- 30	dB
3fo	3rd. harmonic			- 35	
ρ_{in}	Input VSWR			2.8	—
—	Load VSWR tolerance	$V_{cc1}=12.5\text{V}$, $V_{cc2}=15.2\text{V}$, $V_{BB}=5\text{V}$ $P_o = 13\text{W}$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50\Omega$	No degradation		—

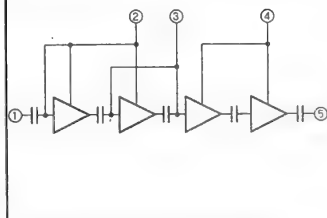
M67709M

390~430MHz, 12.5V, 13W, FM MOBILE RADIO

OUTLINE DRAWING



BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	Vbb ≤ 5V	16	V
Vbb		Vcc ≤ 12.5V	6	V
Icc	Total current		5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	20	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

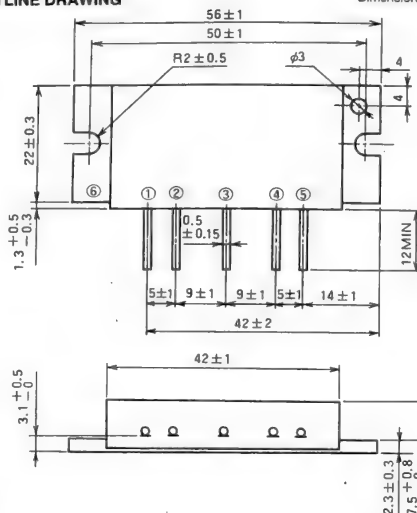
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		390	430	MHz
P _o	Output power	P _{in} = 10mW	13		W
η _T	Total efficiency	Vcc1, 2 = 12.5V	35		%
2fo	2nd. harmonic	Vbb = 5V		-30	dB
3fo	3rd. harmonic	Z _G = Z _L = 50 Ω		-35	dB
ρ _{in}	Input VSWR			2.8	—
—	Load VSWR tolerance	Vcc1 = 12.5V, Vcc2 = 15.2V, Vbb = 5V P _o = 13W (P _{in} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z _G = 50Ω	No degradation		—

M67709SH

490~512MHz, 12.5V, 13W, FM MOBILE RADIO

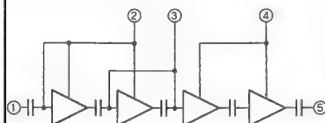
OUTLINE DRAWING

Dimensions in mm



H16

BLOCK DIAGRAM



PIN :

- ① P_{in} : RF INPUT
- ② V_{cc1} : 1st. DC SUPPLY
- ③ V_{BB} : BASE BIAS
- ④ V_{cc2} : 2nd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V_{cc}	Supply voltage	$V_{BB} \leq 5V$	16	V
V_{BB}		$V_{cc} \leq 12.5V$	6	V
I_{cc}	Total current		5	A
$P_{in(max)}$	Input power	$Z_G = Z_L = 50 \Omega$	20	mW
$P_{o(max)}$	Output power	$Z_G = Z_L = 50 \Omega$	20	W
$T_{c(OP)}$	Operation case temperature		$-30 \sim 110$	$^\circ\text{C}$
T_{stg}	Storage temperature		$-40 \sim 110$	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

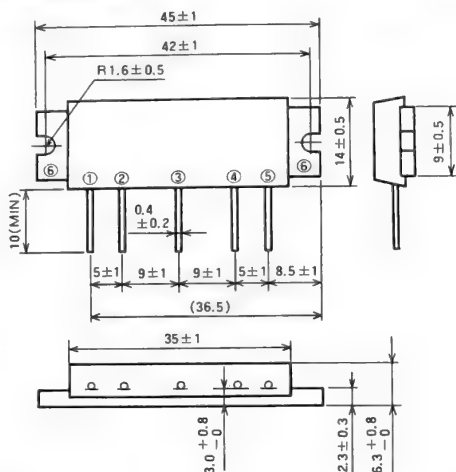
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		490	512	MHz
P_o	Output power	$P_{in} = 10\text{mW}$	13		W
η_T	Total efficiency	$V_{cc1,2} = 12.5V$	35		%
$2f_o$	2nd. harmonic	$V_{BB} = 5V$		-30	dB
$3f_o$	3rd. harmonic	$Z_G = Z_L = 50 \Omega$		-35	dB
ρ_{in}	Input VSWR			2.8	—
—	Load VSWR tolerance	$V_{cc1} = 12.5V$, $V_{cc2} = 15.2V$, $V_{BB} = 5V$ $P_o = 13W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50\Omega$	No degradation		—

M67710L

135~160MHz, 9.6V, 7W, FM PORTABLE RADIO

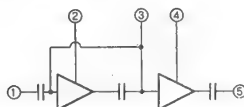
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③VBB : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

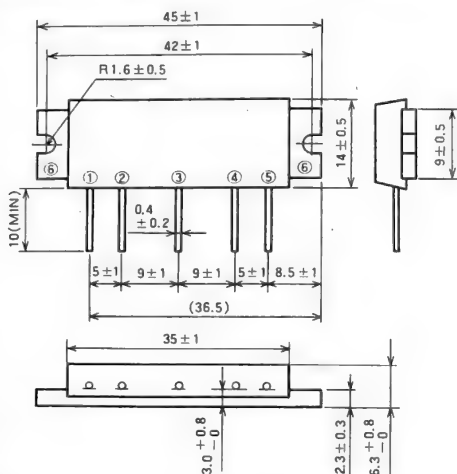
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		13	V
VBB			6	V
Icc	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	80	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		135	160	MHz
P _o	Output power	P _{in} = 50mW	7		W
η_T	Total efficiency	V _{BB} = 5V	40		%
2f _o	2nd. harmonic	V _{CC} = 9.6V		-20	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
p _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{CC1, 2} = 13V, V _{BB} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

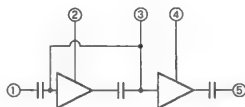
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③VBB : BASE BIAS
④Vcc2 : 2nd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

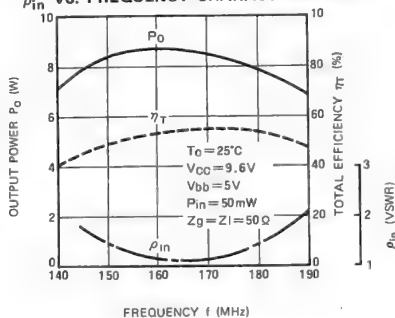
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		13	V
V _{BB}			6	V
I _{CC}	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	80	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 50mW$ $V_{BS} = 5V$ $V_{CC} = 9.6V$ $Z_G = Z_L = 50 \Omega$	150	175	MHz
Po	Output power		7		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			- 20	dB
3fo	3rd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	$V_{CC1, 2} = 13V, V_{BS} = 5V$ $P_o = 7W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

150~175MHz, 9.6V, 7W, FM PORTABLE RADIO

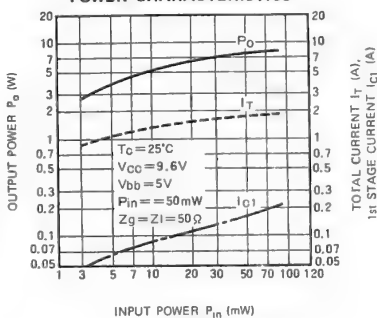
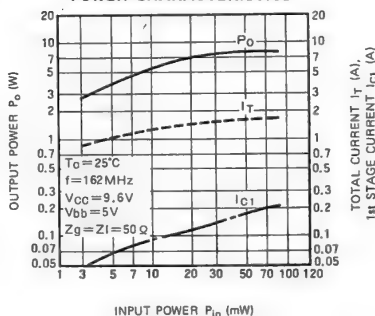
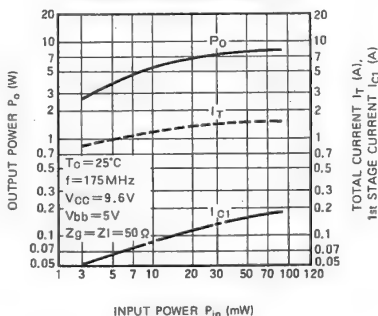
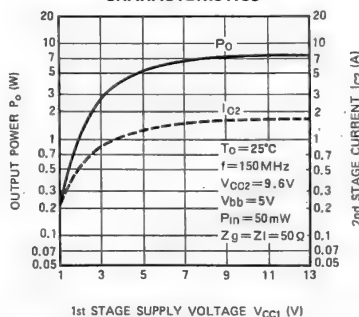
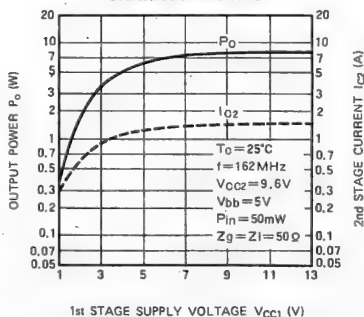
TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,

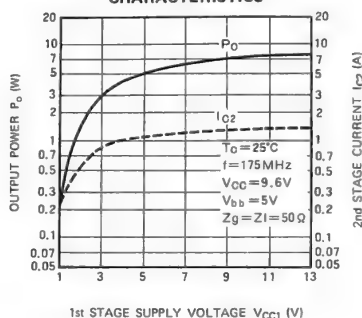
 P_{in} VS. FREQUENCY CHARACTERISTICS

OUTPUT POWER, TOTAL CURRENT,

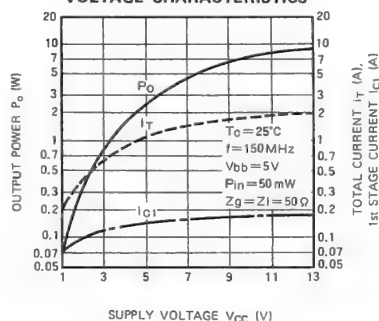
1st STAGE CURRENT VS. INPUT POWER CHARACTERISTICS

OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICSOUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS

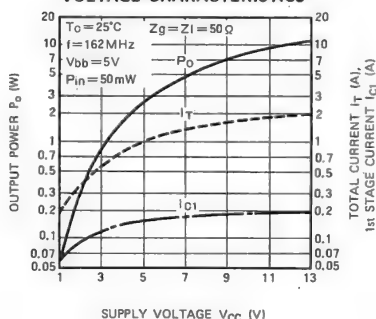
OUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS



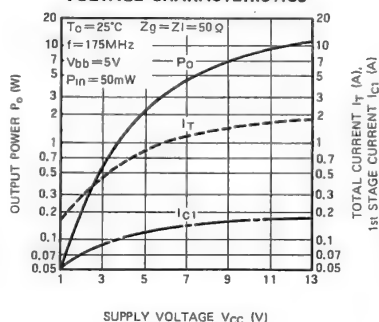
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



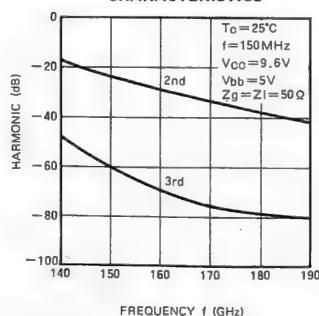
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS

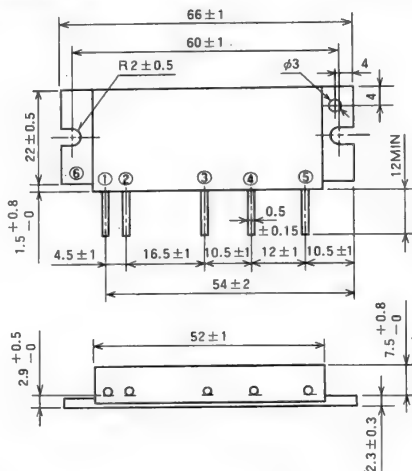


2nd, 3rd HARMONIC VS. FREQUENCY
CHARACTERISTICS



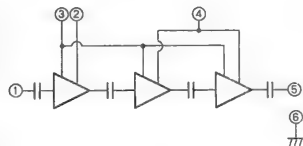
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③V_B : BASE BIAS DC SUPPLY
④Vcc2 : 2nd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

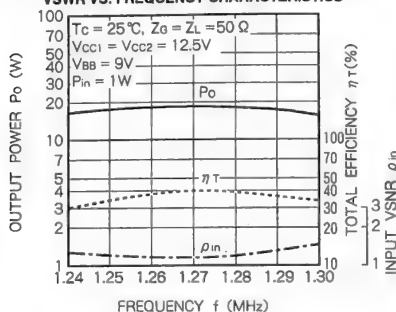
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC1, 2}	Supply voltage		17	V
V _{BB}			10	V
I _{CC}	Total current		8	A
P _{IN(max)}	Input power	V _{CC1} =12.5V, V _{BB} =9V, Z _G =Z _L =50Ω	2	W
P _{O(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	VCC1 = VCC2 = 12.5V VBB = 9V PIN = 1W Z0 = ZL = 50 Ω	1240	1300	MHz
Po	Output power		16		W
η T	Total efficiency		30		%
2fo	2nd. harmonic			- 45	dB
ρ in	Input VSWR			2.0	-
-	Load VSWR tolerance	VCC1 = VCC2 = 15.2V, VBB = 9V Po = 16W (PIN : controlled) Load VSWR=16:1 (All phase), 5sec.	No degradation		-

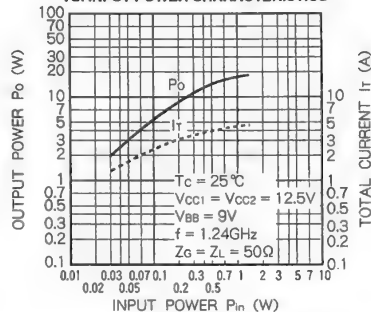
1240~1300MHz, 12.5V, 16W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

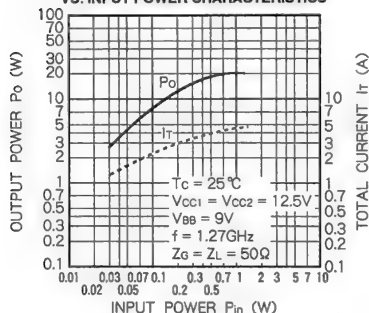
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



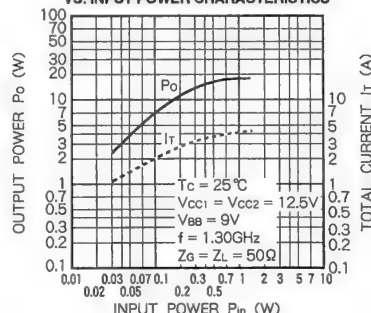
OUTPUT POWER, TOTAL CURRENT, VS. INPUT POWER CHARACTERISTICS



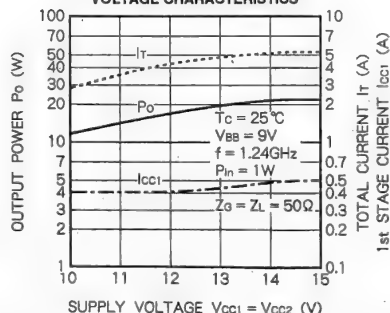
OUTPUT POWER, TOTAL CURRENT, VS. INPUT POWER CHARACTERISTICS



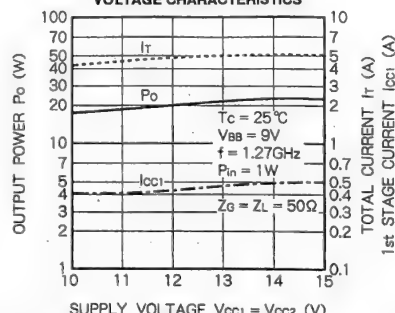
OUTPUT POWER, TOTAL CURRENT, VS. INPUT POWER CHARACTERISTICS



OUTPUT POWER, TOTAL CURRENT, 1st STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

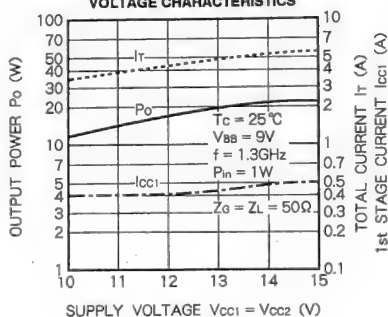


OUTPUT POWER, TOTAL CURRENT, 1st STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

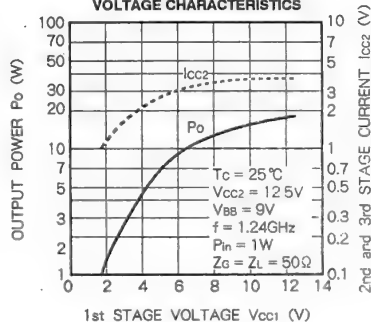


1240~1300MHz, 12.5V, 16W, FM MOBILE RADIO

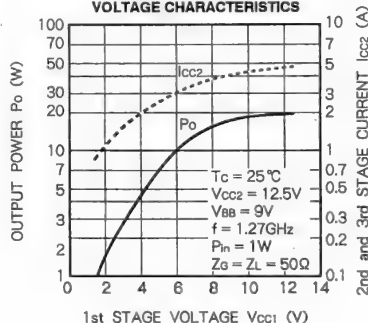
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



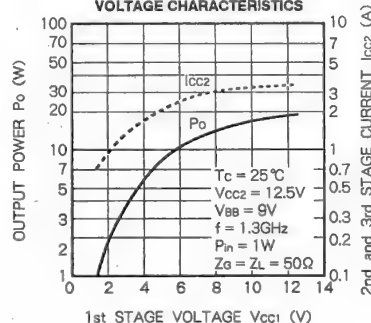
OUTPUT POWER, 2nd and 3rd STAGE
CURRENT VS. 1st STAGE
VOLTAGE CHARACTERISTICS



OUTPUT POWER, 2nd and 3rd STAGE
CURRENT VS. 1st STAGE
VOLTAGE CHARACTERISTICS

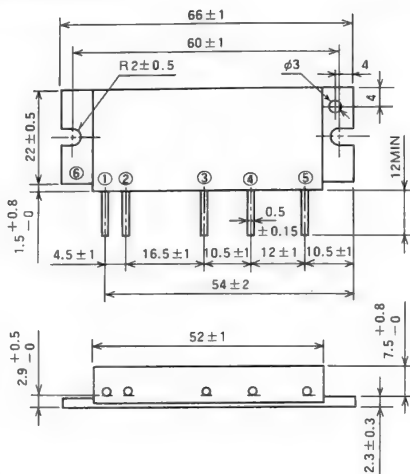


OUTPUT POWER, 2nd and 3rd STAGE
CURRENT VS. 1st STAGE
VOLTAGE CHARACTERISTICS



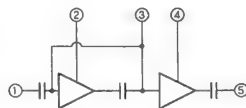
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
V _{BB}	Base bias		10	V
I _{CC}	Total current		7	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.65	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	40	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

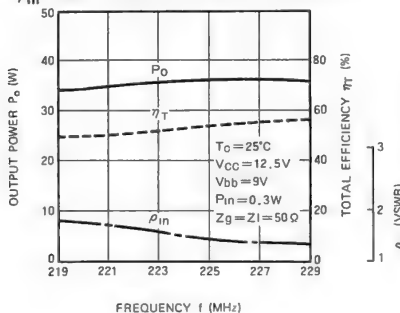
ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		220	225	MHz
P _o	Output power	P _{in} = 0.3W V _{cc} = 12.5V Z _G = Z _L = 50 Ω	30		W
η _T	Total efficiency		43		%
2f _o	2nd. harmonic			-30	dB
3f _o	3rd. harmonic			-35	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, V _{BB} = 9V P _o = 30W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

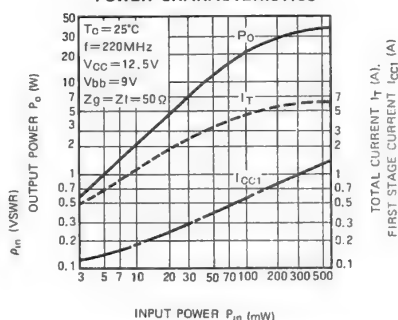
220~225MHz, 12.5V, 30W, SSB MOBILE RADIO

TYPICAL PERFORMANCE DATA

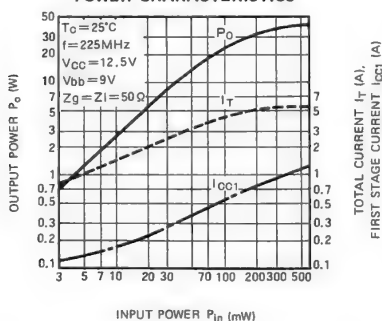
OUTPUT POWER, TOTAL EFFICIENCY,
VS. FREQUENCY CHARACTERISTICS



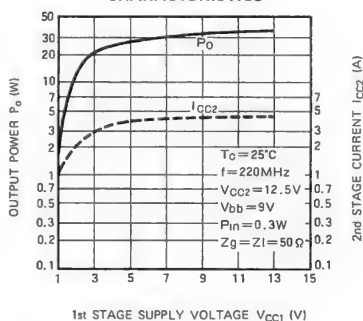
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICS



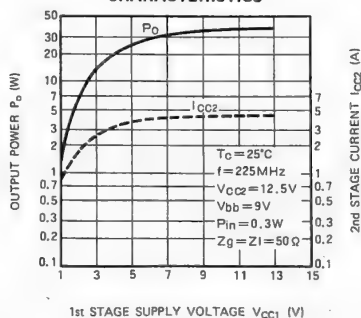
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICS



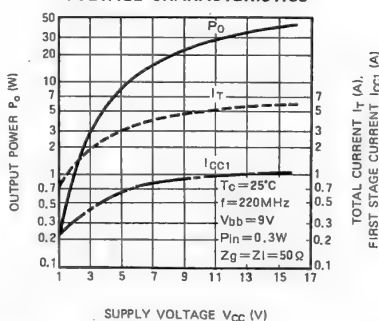
OUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS



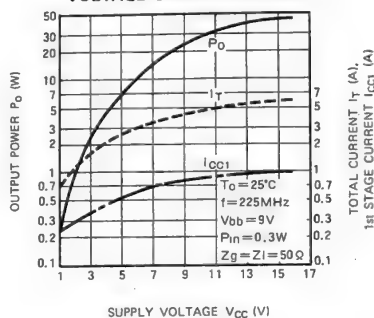
OUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS



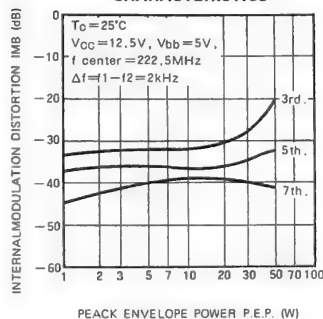
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



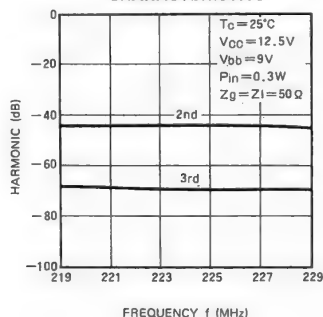
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



INTERNAL MODULATION DISTORTION
VS. PEACK ENVELOPE POWER
CHARACTERISTICS

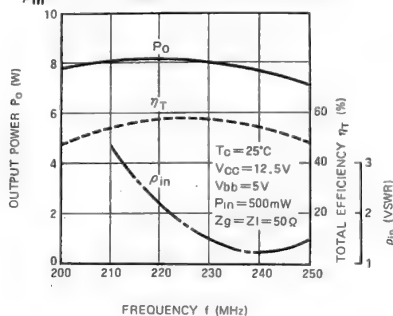
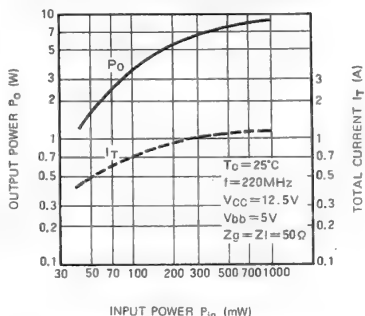
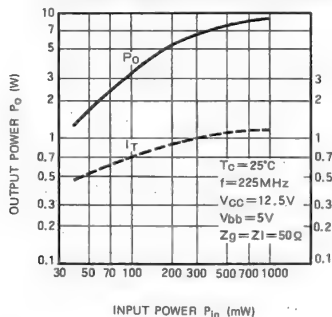
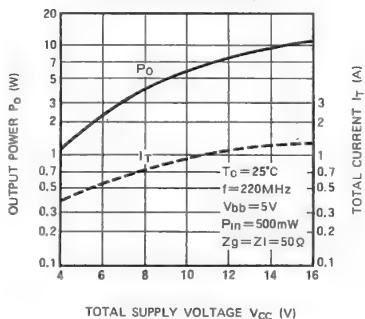
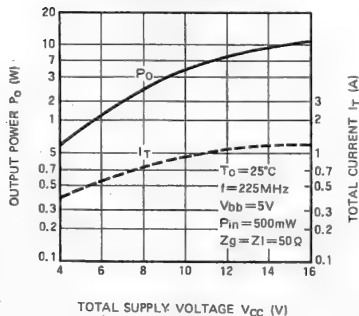
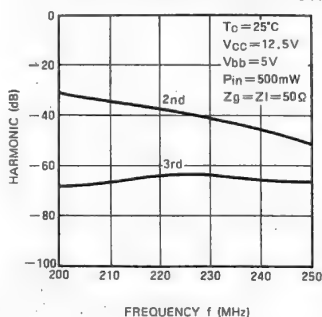


2nd, 3rd HARMONIC VS. FREQUENCY
CHARACTERISTICS



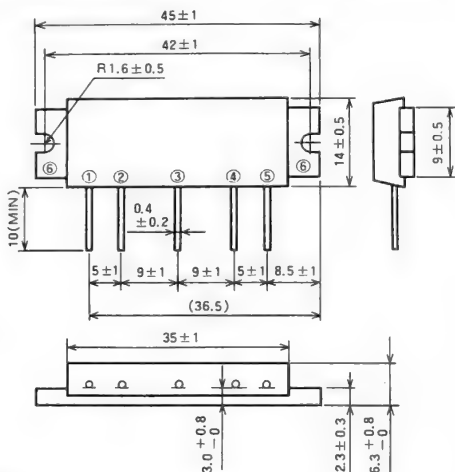
2—195

TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
 ρ_{in} VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
VS. TOTAL SUPPLY VOLTAGE
CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
VS. TOTAL SUPPLY VOLTAGE
CHARACTERISTICS2nd, 3rd HARMONIC VS. FREQUENCY
CHARACTERISTICS CURRENT
VS. INPUT POWER CHARACTERISTICS

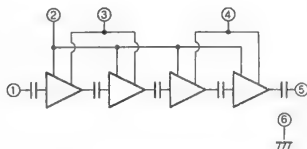
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vbb : BASE BIAS
④Vcc2 : 2nd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

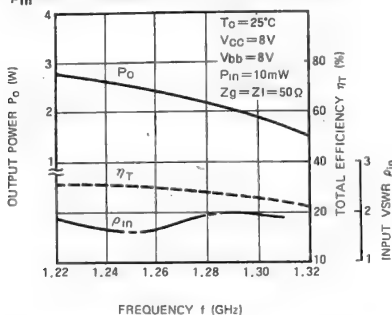
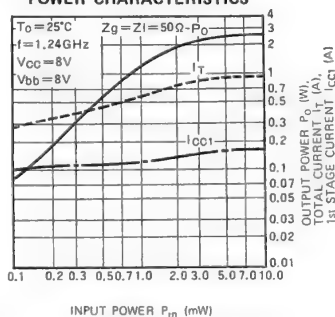
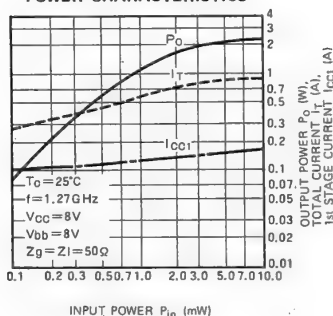
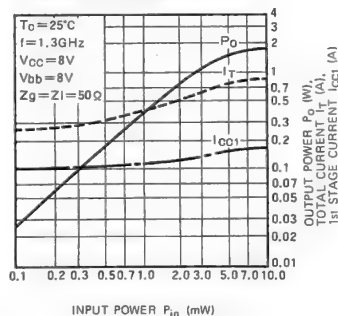
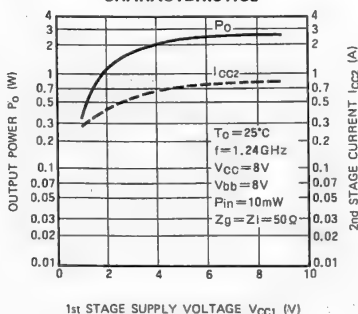
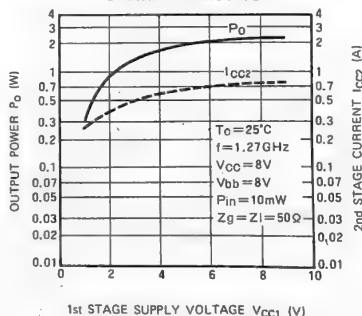
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC1}	1st. DC supply		9	V
V _{BB}	Base bias		9	V
V _{CC2}	2nd. DC supply		16	V
I _{CC}	Total current		1.5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	10	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	4	W
T _{C(OP)}	Operation case temperature		- 20~100	°C
T _{stg}	Storage temperature		- 40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	VCC1 = VCC2 = VBB = 8V P _{IN} = 10mW Z _G = Z _L = 50 Ω	1240	1300	MHz
P _o	Output power		1.2		W
η _T	Total efficiency		18		%
2f _o	2nd. harmonic			-30	dB
3f _o	3rd. harmonic			-35	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	VCC1 = 9V, VCC2 = 15.2V, VBB = 9V P _o = 1.5W(P _{IN} : controlled), Z _G = 50Ω Load VSWR=10:1 (All phase), 5sec	No degradation		-
IMD ₃	3rd. inter modulation distortion	VCC1=VCC2=VBB=8V P _{o(PERP)} =1.26W, Δf=20kHz, Z _G =Z _L =50 Ω		-23	dBc

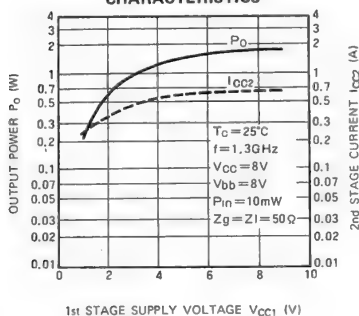
1240~1300MHz, 8V, 1.2W, SSB PORTABLE RADIO

TYPICAL PERFORMANCE DATA

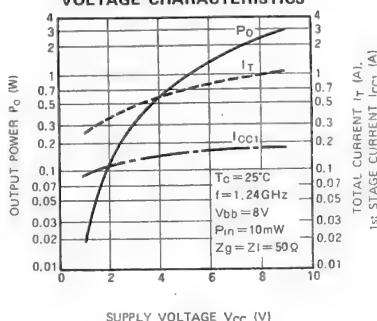
OUTPUT POWER, TOTAL EFFICIENCY,
VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICSOUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS

1240~1300MHz, 8V, 1.2W, SSB PORTABLE RADIO

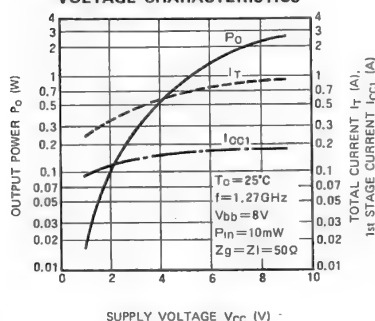
OUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS



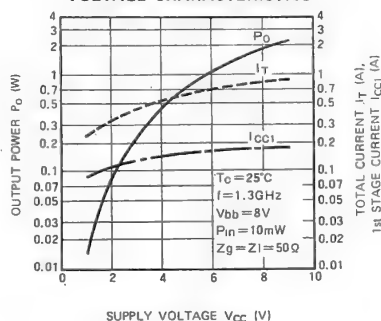
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



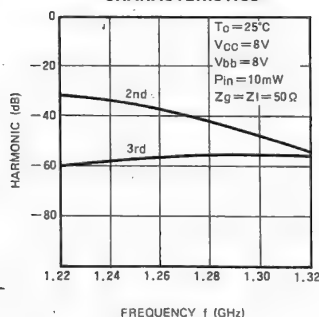
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



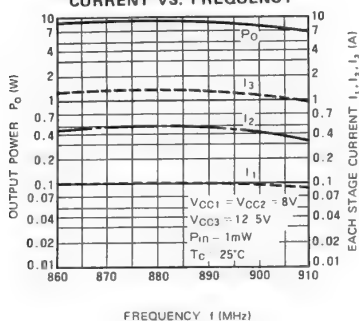
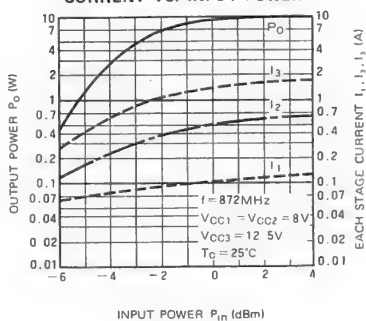
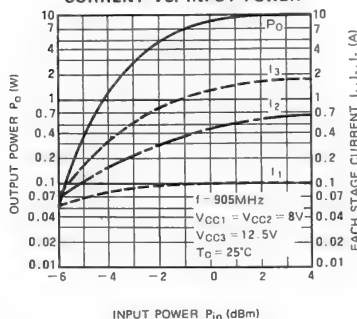
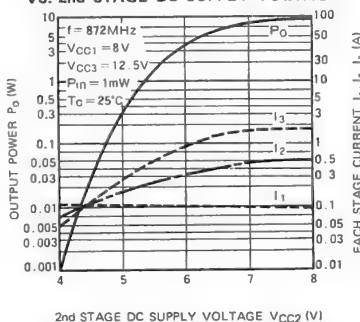
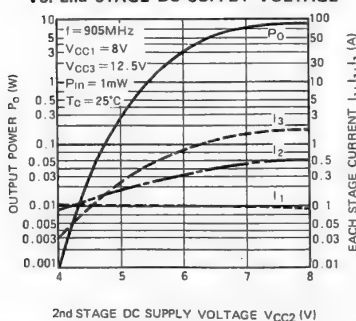
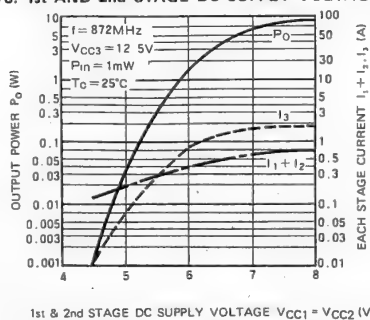
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



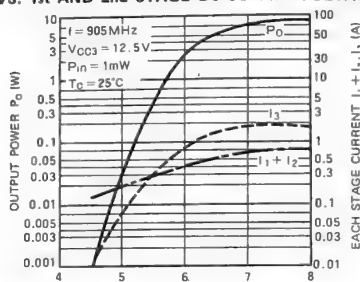
2nd, 3rd HARMONIC VS. FREQUENCY
CHARACTERISTICS



TYPICAL PERFORMANCE DATA

OUTPUT POWER, EACH STAGE
CURRENT VS. FREQUENCYOUTPUT POWER, EACH STAGE
CURRENT VS. INPUT POWEROUTPUT POWER, EACH STAGE
CURRENT VS. INPUT POWEROUTPUT POWER, EACH STAGE CURRENT
VS. 2nd STAGE DC SUPPLY VOLTAGEOUTPUT POWER, EACH STAGE CURRENT
VS. 2nd STAGE DC SUPPLY VOLTAGEOUTPUT POWER, EACH STAGE CURRENT
VS. 1st AND 2nd STAGE DC SUPPLY VOLTAGE

OUTPUT POWER, EACH STAGE CURRENT
VS. 1st AND 2nd STAGE DC SUPPLY VOLTAGE



1st & 2nd STAGE DC SUPPLY VOLTAGE $V_{CC1} = V_{CC2}$ (V)

DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to the following consideration when designing a heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistances between junction of incorporated transistors and case are shown in the followings.

- First stage transistor
 $R_{th(j-c)1} = 20^{\circ}\text{C/W}$ (Typ.)
- Second stage transistor
 $R_{th(j-c)2} = 17.5^{\circ}\text{C/W}$ (Typ.)
- Third stage transistor
 $R_{th(j-c)3} = 16^{\circ}\text{C/W}$ (Typ.)
- Fourth stage transistor
 $R_{th(j-c)4} = 9^{\circ}\text{C/W}$ (Typ.)
- Final stage transistor
 $R_{th(j-c)5} = 6.5^{\circ}\text{C/W}$ (Typ.)

- (2) V_{CC} , I_T , RF input & output power conditions at standard operation for each stage transistors are estimated as follows.

$P_O = 7\text{W}$, $V_{CC1} = V_{CC2} = 8\text{V}$, $V_{CC3} = 12.5\text{V}$, $P_{in} = 1\text{mW}$, $\eta_T = 35\%$ (minimum ratings),
 $I_{1+2} = 0.781\text{A}$ (Total current from 1st stage to 4th stage)

$I_3 = 1.1\text{A}$ (Current of 5th stage)

The conditions at standard operation for each stage transistors are shown in Table 1.

- Junction temperature of the first stage transistor
 $T_{j1} = (V_{CC1} \times I_{T1} - P_{O1} + P_{in}) \times R_{th(j-c)1} + T_c$ (Note 1)
 $= (8 \times 0.045 - 0.02 + 0.001) \times 20 + T_c$
 $= 6.8 + T_c$ ($^{\circ}\text{C}$)

Note 1: Case temperature of device

- Junction temperature of the second stage transistor
 $T_{j2} = (V_{CC1} \times I_{T2} - P_{O2} + P_{O1}) \times R_{th(j-c)2} + T_c$
 $= (8 \times 0.08 - 0.2 + 0.02) \times 17.5 + T_c$

Table 1: The conditions at standard operation

Stage	V_{CC} (V)	I_T (mA)	P_{in} (mW)	P_O (mW)
1st	8	45	1	20
2nd	8	80	20	200
3rd	8	160	200	500
4th	8	496	500	2000
5th	12.5	1100	2000	7000

$$= 8.1 + T_c$$

- Junction temperature of the third stage transistor
 $T_{j3} = (V_{CC2} \times I_{T3} - P_{O3} + P_{O2}) \times R_{th(j-c)3} + T_c$
 $= (8 \times 0.16 - 0.5 + 0.2) \times 16 + T_c$
 $= 15.7 + T_c$ ($^{\circ}\text{C}$)
- Junction temperature of the fourth stage transistor
 $T_{j4} = (V_{CC2} \times I_{T4} - P_{O4} + P_{O3}) \times R_{th(j-c)4} + T_c$
 $= (8 \times 0.496 - 2 + 0.5) \times 9 + T_c$
 $= 22.2 + T_c$ ($^{\circ}\text{C}$)
- Junction temperature of the final stage transistor
 $T_{j5} = (V_{CC3} \times I_{T5} - P_O + P_{O4}) \times R_{th(j-c)5} + T_c$
 $= (12.5 \times 1.1 - 7 + 2) \times 6.5 + T_c$
 $= 56.9 + T_c$ ($^{\circ}\text{C}$)

2. Heat sink design

In thermal design of heat sink, keep the case temperature below 90°C at output power $P_O = 7\text{W}$ and ambient temperature = 60°C .

The thermal resistance $R_{th(c-a)}$ (Note 2) of the heat sink to realize this:

$$R_{th(c-a)} = \frac{T_c - T_a}{(P_O/\eta_T) - P_O + P_{in}} = \frac{90 - 60}{(7/0.35 - 7 + 0.001)} = 2.31$$

Note 2: Including the contact thermal resistance between device and heat sink

Mounting the device on the heat sink with above thermal resistance, junction temperatures of each transistor become:
 $T_{j1} = 97^{\circ}\text{C}$, $T_{j2} = 99^{\circ}\text{C}$, $T_{j3} = 106^{\circ}\text{C}$, $T_{j4} = 113^{\circ}\text{C}$,
 $T_{j5} = 147^{\circ}\text{C}$ at $T_a = 60^{\circ}\text{C}$, $T_c = 90^{\circ}\text{C}$.

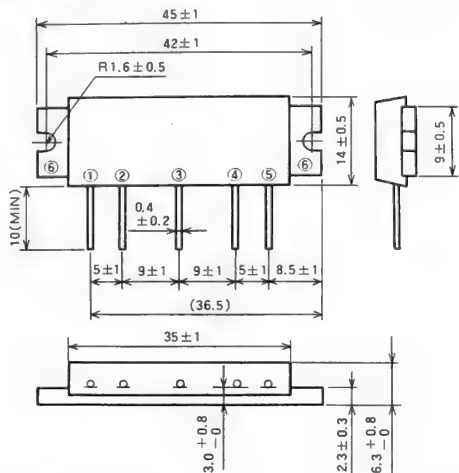
Since the annual average of ambient temperature is 30°C , junction temperatures of each transistor become;

$$T_{j1} = 67^{\circ}\text{C}, T_{j2} = 69^{\circ}\text{C}, T_{j3} = 76^{\circ}\text{C}, T_{j4} = 76^{\circ}\text{C}, T_{j5} = 117^{\circ}\text{C}$$

As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

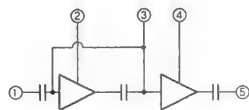
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

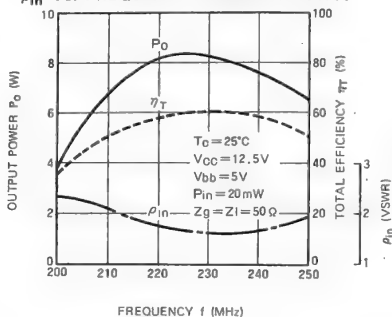
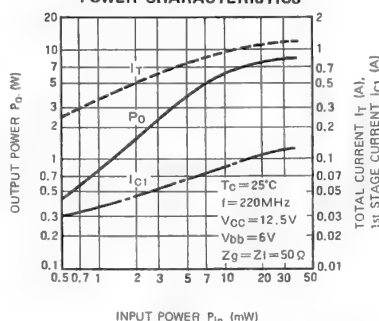
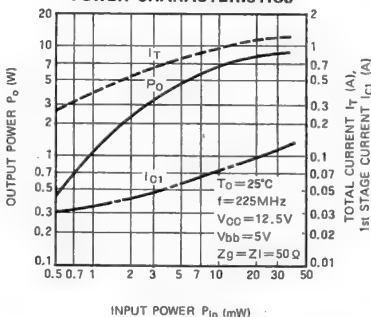
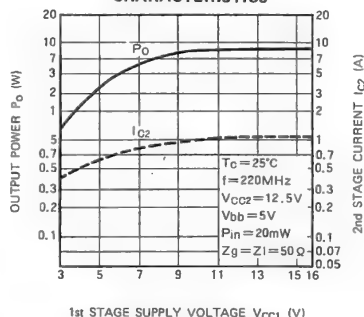
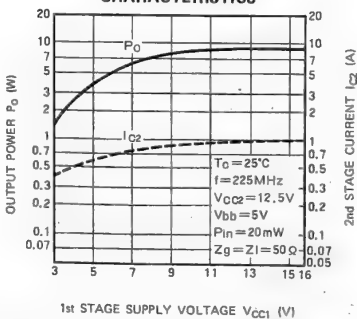
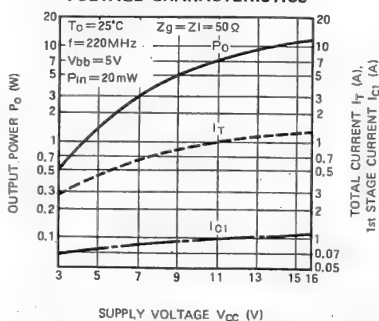
ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		16	V
Vbb			6	V
Icc	Total current		4	A
P _{in(max)}	Input power	Z _g = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z _g = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	$^\circ\text{C}$
T _{stg}	Storage temperature		-40~110	$^\circ\text{C}$

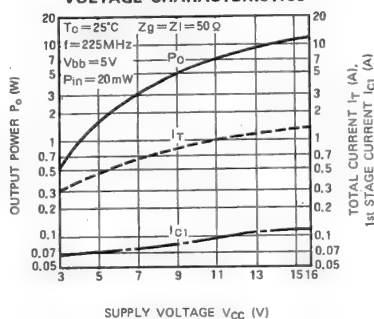
ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		220	225	MHz
P _o	Output power	P _{in} = 20mW	7		W
η_T	Total efficiency	V _{bb} = 5V	45		%
2fo	2nd. harmonic	Vcc = 12.5V		-20	dB
3fo	3rd. harmonic	Z _g = Z _L = 50 Ω		-30	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	Vcc = 13.2V, V _{bb} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z _g = 50 Ω	No degradation		-

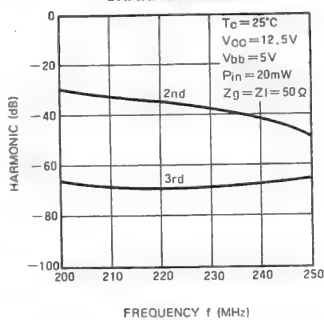
TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY,
 P_{in} VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICSOUTPUT POWER, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS

OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS

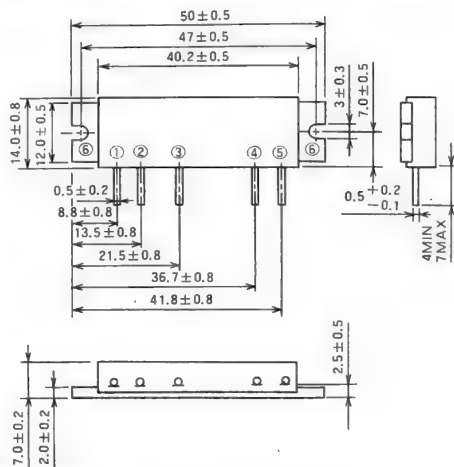


2nd, 3rd HARMONIC VS. FREQUENCY
CHARACTERISTICS



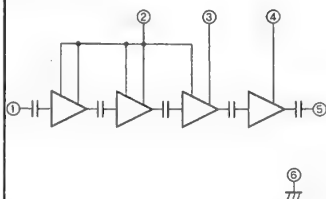
OUTLINE DRAWING

Dimensions in mm



H25

BLOCK DIAGRAM



PIN :

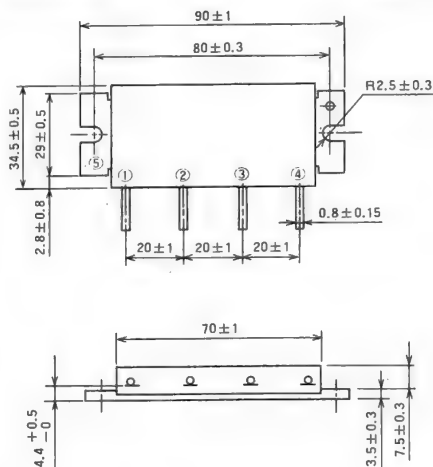
- ①Pin : RF INPUT
②VCC1 : 1st. DC SUPPLY
③VCC2 : 2nd. DC SUPPLY
④VCC3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		9	V
I _{CC}	Total current		3	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, V _{CC1} ≤ 7.2V	7	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	3	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = Vcc3 = 7.2V	824	849	MHz
Po	Output power	Pin = 1mW, Z0 = ZL = 50 Ω	1.6		W
ηT	Total efficiency	PO = 1.6W (Vcc1 : controlled)	35		%
2fo	2nd. harmonic	Vcc2 = Vcc3 = 7.2V		- 30	dB
ρin	Input VSWR	Pin = 1mW, Z0 = ZL = 50Ω		2.8	—
—	Load VSWR tolerance	Vcc2 = Vcc3 = 9V PO = 1.6W (Vcc1 : controlled) Pin = 1mW Load VSWR=20:1 (All phase), 2sec.	No degradation		—

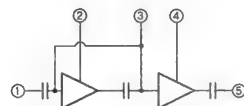
OUTLINE DRAWING

Dimensions in mm



H17

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③VBB : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

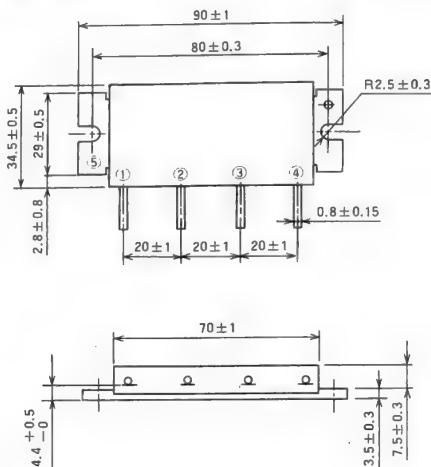
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		16	V
VBB			10	V
Icc	Total current		24	A
P _{in(max)}	Input power	$Z_G = Z_L = 50 \Omega$	0.8	W
P _{o(max)}	Output power	$Z_G = Z_L = 50 \Omega$	78	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		144	148	MHz
P _o	Output power	P _{in} = 0.5W	60		W
η_T	Total efficiency	V _{BB} = 9V	50		%
2f _o	2nd. harmonic	V _{cc} = 12.5V		-30	dB
3f _o	3rd. harmonic	$Z_G = Z_L = 50 \Omega$		-35	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.2V, V _{BB} = 9V P _o = 55W (P _{in} : controlled) Load VSWR=8.8:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

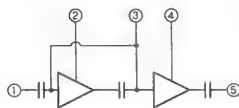
OUTLINE DRAWING

Dimensions in mm



H17

BLOCK DIAGRAM



PIN :

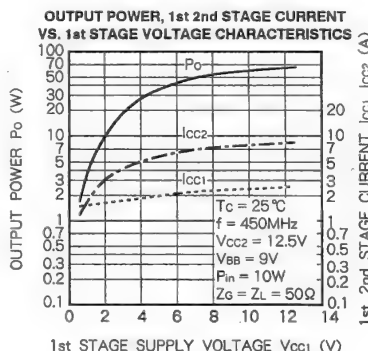
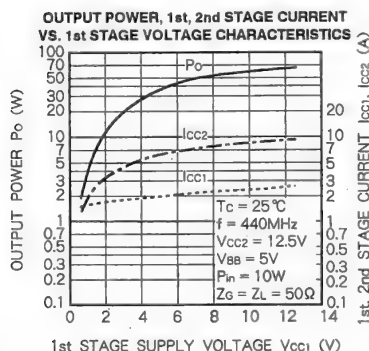
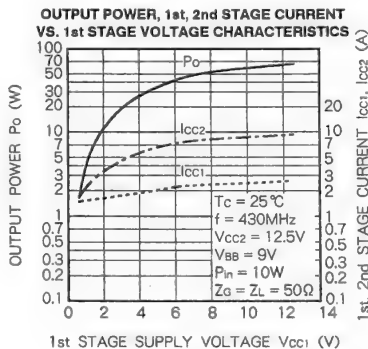
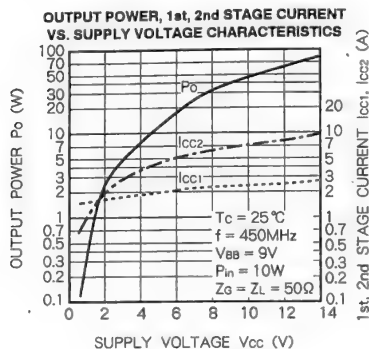
- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		16	V
Vbb			10	V
Icc	Total current		25	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	14	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	78	W
T _{c(OP)}	Operation case temperature		-30~110	$^\circ\text{C}$
T _{stg}	Storage temperature		-40~110	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		430	450	MHz
P _o	Output power	P _{in} = 10W	60		W
η_T	Total efficiency	V _{bb} = 9V	40		%
2f _o	2nd. harmonic	V _{cc} = 12.5V		-30	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		-35	dB
ρ_{in}	Input VSWR			2	-
-	Load VSWR tolerance	V _{cc1, 2} = 15.2V, V _{bb} = 9V P _o = 55W (P _{in} : controlled) Load VSWR=8.8:1 (All phase), 2sec. Z _G = 50 Ω	No degradation		-

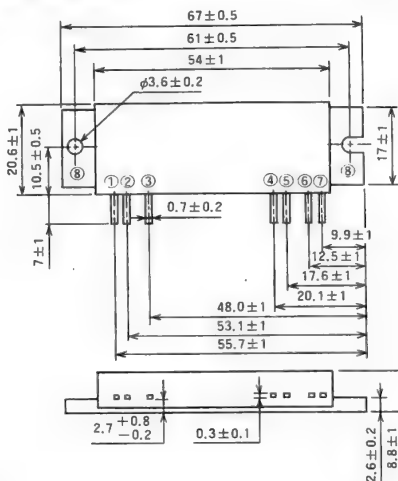
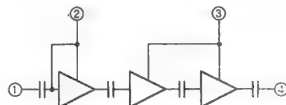


M67729L2

400~420MHz, 12.5V, 20W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm

**H18****BLOCK DIAGRAM**

PIN :

①Pin : RF INPUT

②GND

③Vcc1 : 1st. DC SUPPLY

④GND

⑤Vcc2 : 2nd. DC SUPPLY

⑥GND

⑦Po : RF OUTPUT

⑧GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

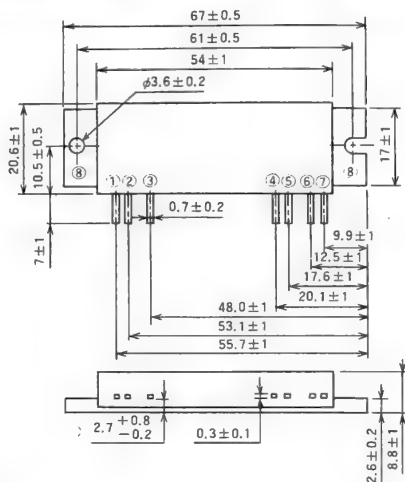
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		16	V
Icc	Total current		6	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	0.3	W
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	30	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		400	420	MHz
P _o	Output power	P _{in} = 0.15W Vcc = 12.5V	20		W
η _T	Total efficiency	Z ₀ = Z _L = 50 Ω	35		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.5V, P _o = 25W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

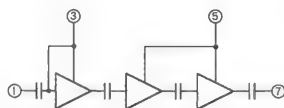
OUTLINE DRAWING

Dimensions in mm



H18

BLOCK DIAGRAM



PIN :

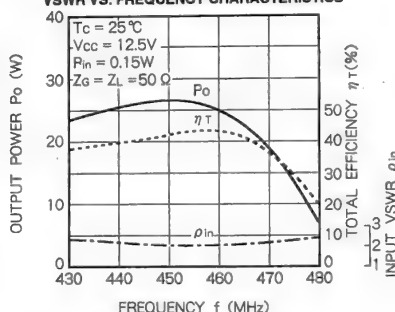
- ① P_{in} : RF INPUT
② GND
③ V_{cc1} : 1st. DC SUPPLY
④ GND
⑤ V_{cc2} : 2nd. DC SUPPLY
⑥ GND
⑦ P_o : RF OUTPUT
⑧ GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		16	V
I _{cc}	Total current		6	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.3	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	30	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

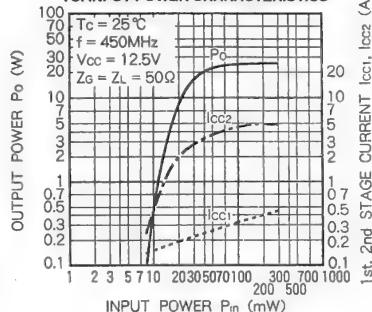
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.15W V _{cc} = 12.5V Z ₀ = Z _L = 50 Ω	450	460	MHz
P _o	Output power		20		W
η T	Total efficiency		35		%
2f ₀	2nd. harmonic			- 30	dB
ρ in	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc} = 15.5V, P _o = 25W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

TYPICAL PERFORMANCE DATA

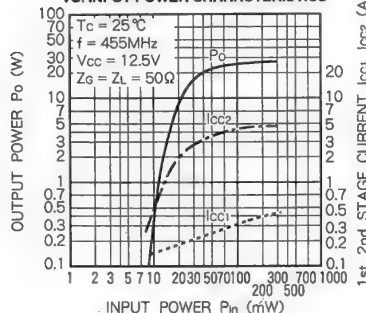
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



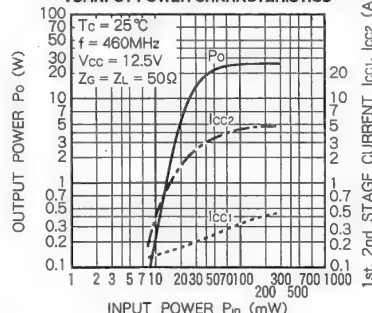
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



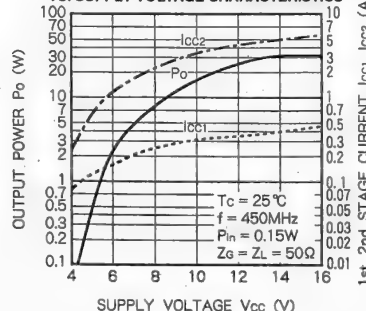
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



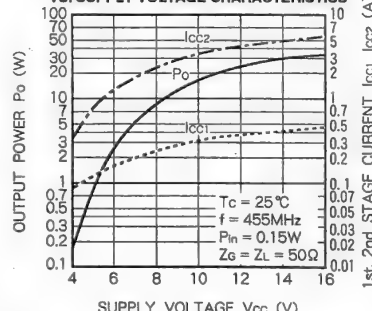
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

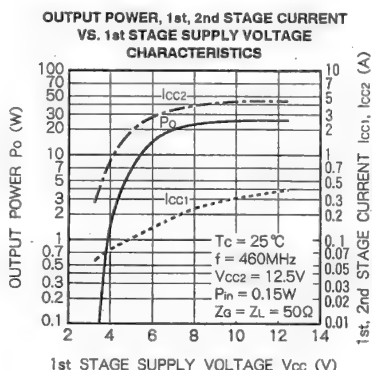
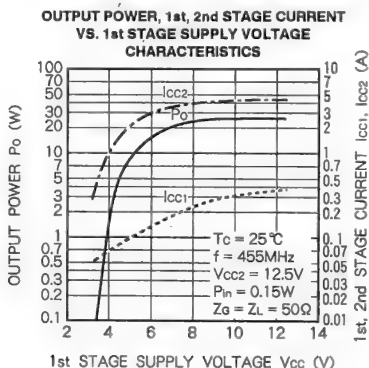
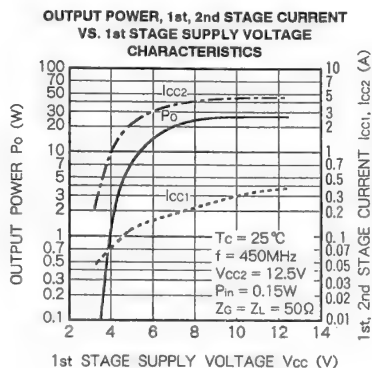
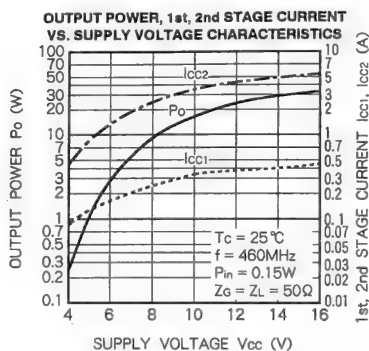


OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS



M67729H2

450-460MHz, 12.5V, 20W, FM MOBILE RADIO

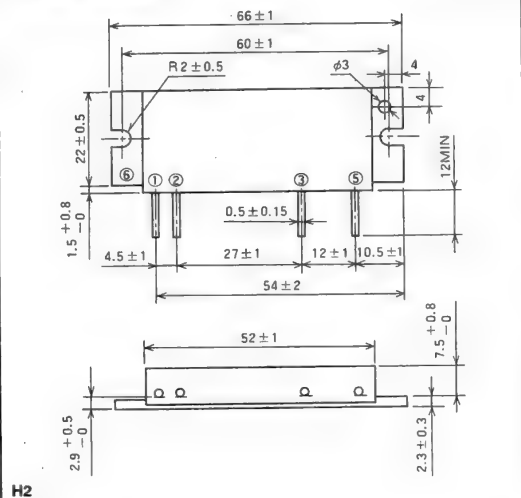


M67730L

175~200MHz, 12.5V, 30W, FM MOBILE RADIO

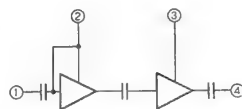
OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Po : RF OUTPUT
- ⑤GND : FIN

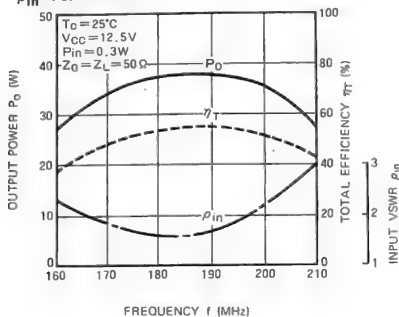
ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		17	V
Icc	Total current		7	A
P _{in(max)}	Input power	Z _g = Z _L = 50 Ω	0.6	W
P _{o(max)}	Output power	Z _g = Z _L = 50 Ω	40	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

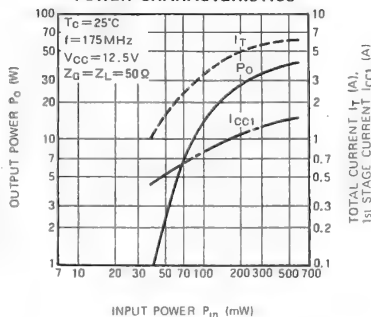
ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		175	200	MHz
P _o	Output power		30		W
η _T	Total efficiency	P _{in} = 0.3W Vcc = 12.5V	43		%
2f _o	2nd. harmonic	Z _g = Z _L = 50 Ω		-30	dB
3f _o	3rd. harmonic			-35	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc = 15.2V, P _o = 30W (P _{in} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z _g = 50 Ω	No degradation		-

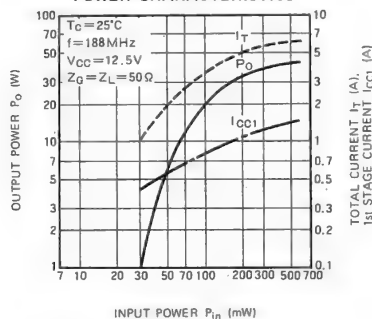
TYPICAL PERFORMANCE DATA OUTPUT POWER, TOTAL EFFICIENCY, ρ_{in} VS. FREQUENCY CHARACTERISTICS



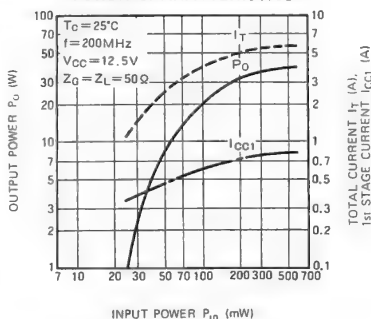
OUTPUT POWER, TOTAL CURRENT, 1st STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



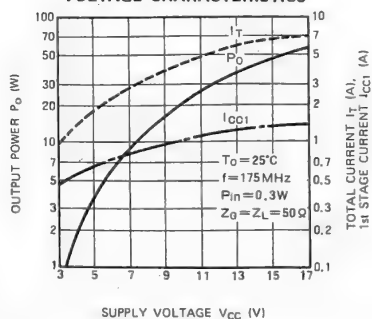
OUTPUT POWER, TOTAL CURRENT, 1st STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



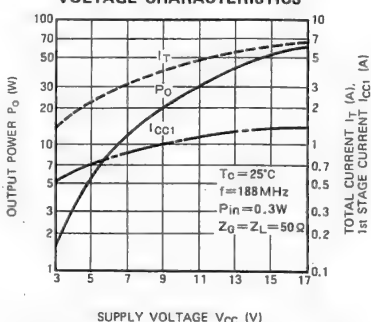
OUTPUT POWER, TOTAL CURRENT, 1st STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



OUTPUT POWER, TOTAL CURRENT, 1st STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

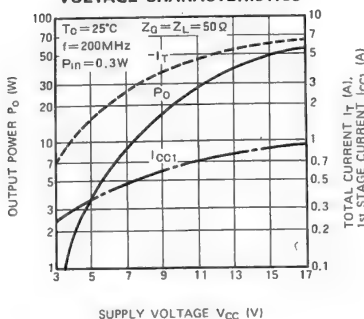


OUTPUT POWER, TOTAL CURRENT, 1st STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

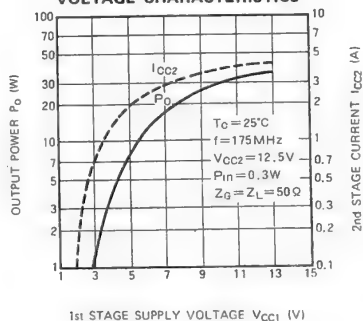


175-200MHz, 12.5V, 30W, FM MOBILE RADIO

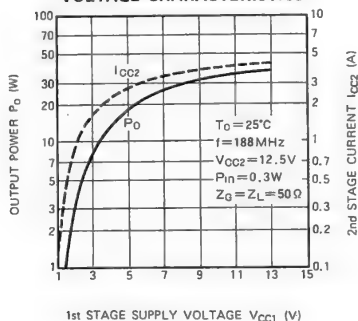
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



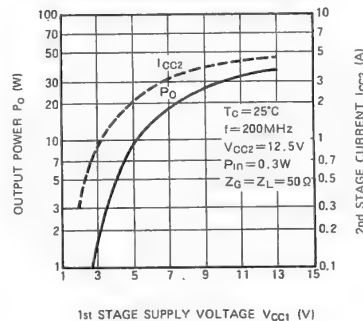
OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



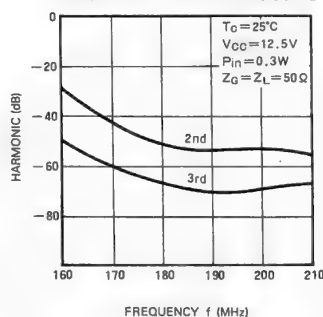
OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



2nd, 3rd HARMONIC VS.
FREQUENCY CHARACTERISTICS



DESIGN CONSIDERATION OF HEAT RADIATION

Please refer to following consideration when designing heat sink.

1. Junction temperature of incorporated transistors at standard operation.

- (1) Thermal resistance between junction and package of incorporated transistors.

a) First stage transistor

$$R_{th(j-c)1} = 8^{\circ}\text{C/W (Typ.)}$$

b) Second stage transistor

$$R_{th(j-c)2} = 2^{\circ}\text{C/W (Typ.)}$$

- (2) Junction temperature of incorporated transistors at standard operation.

Conditions for standard operation.

$P_o = 30\text{W}$, $V_{CC} = 12.5\text{V}$, $P_{In} = 0.3\text{W}$, $\eta_T = 43\%$ (minimum rating), P_{o1} (Note 1) = 5W , $I_T = 5.6\text{A}$ (I_{T1} (2) = 0.9A , I_{T2} (3) = 4.7A)

Note 1: Output power of the first stage transistor

Note 2: Circuit current of the first stage transistor

Note 3: Circuit current of the final stage transistor

Junction temperature of the first stage transistor

$$\begin{aligned} T_{j1} &= (V_{CC} \times I_{T1} - P_{o1} + P_{In}) \times R_{th(j-c)1} + T_C \text{ (4)} \\ &= (12.5 \times 0.9 - 5 + 0.3) \times 8 + T_C \\ &= 52 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

Note 4: Package temperature of device

Junction temperature of the final stage transistor

$$\begin{aligned} T_{j2} &= (V_{CC} \times I_{T2} - P_o + P_{o1}) \times R_{th(j-c)2} + T_C \\ &= (12.5 \times 4.7 - 30 + 5) \times 2 + T_C \\ &= 68 + T_C \text{ (}^{\circ}\text{C)} \end{aligned}$$

2. Heat sink design

In thermal design of heat sink, try to keep the package temperature at the upper limit of the operating ambient temperature (normally $T_a = 60^{\circ}\text{C}$) and at the output power of 28W below 90°C .

The thermal resistance $R_{th(j-a)}$ (5) of the heat sink to realize this:

$$\begin{aligned} R_{th(j-a)} &= \frac{T_C - T_a}{(P_o/\eta_T) - P_o + P_{In}} = \frac{90 - 60}{(30/0.43) - 30 + 0.3} \\ &= 0.75 \text{ (}^{\circ}\text{C/W)} \end{aligned}$$

Note 5: Inclusive of the contact thermal resistance between device and heat sink

Mounting the heat sink of the above thermal resistance on the device.

$$T_{j1} = 142^{\circ}\text{C}, T_{j2} = 158^{\circ}\text{C at } T_a = 60^{\circ}\text{C}, T_C = 90^{\circ}\text{C}.$$

In the annual average of ambient temperature is 30°C ,

$$T_{j1} = 112^{\circ}\text{C}, T_{j2} = 128^{\circ}\text{C}$$

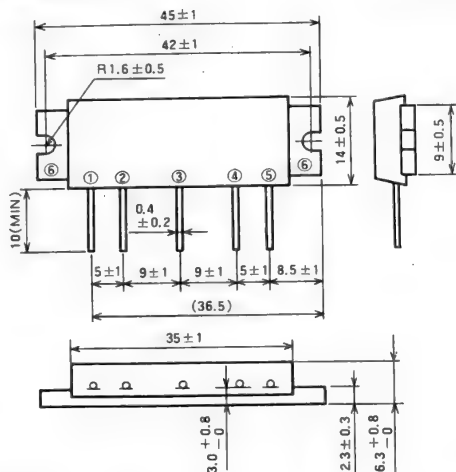
As the maximum junction temperature of these incorporated transistors T_{jmax} are 175°C , application under fully derated condition is ensured.

M67732

1240~1300MHz, 7.2V, 1W, FM PORTABLE RADIO

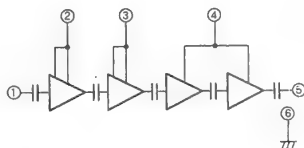
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

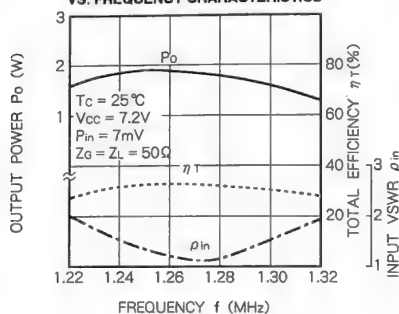
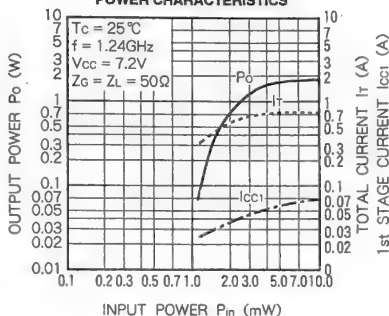
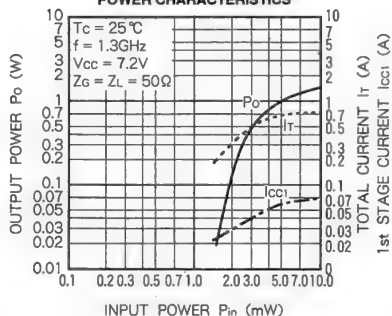
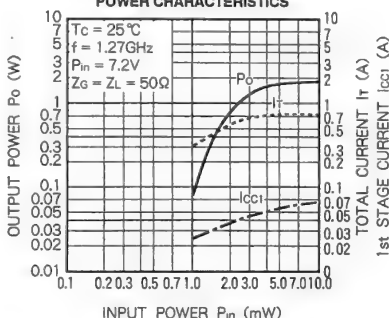
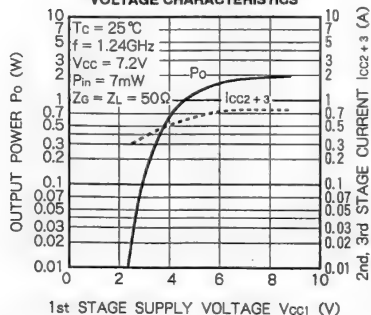
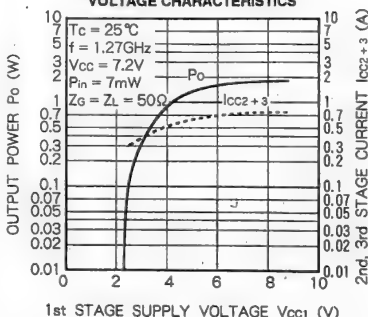
ABSOLUTE MAXIMUM RATINGS (Tc = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc1, 2	Supply voltage		9	V
Vcc3			16	V
Icc	Total current		1.5	A
P _{in(max)}	Input power	Vcc1 = 8V, Z _G = Z _L = 50 Ω	10	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	5	W
T _{c(op)}	Operation case temperature		-20~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25 °C unless otherwise noted)

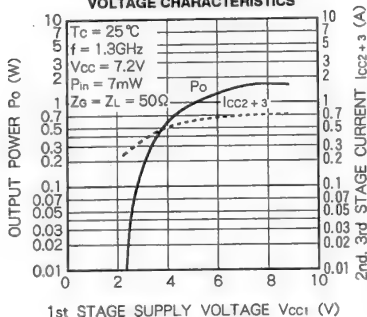
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = Vcc3 = 7.2V P _{in} = 7mW Z _G = Z _L = 50 Ω	1240	1300	MHz
P _o	Output power		1		W
η _T	Total efficiency		25		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	Vcc1 = Vcc2 = 9V, Vcc3 = 15V P _o = 2W (P _{in} : controlled) Load VSWR=10:1 (All phase), 5sec. Z _G = 50 Ω	No degradation		-

TYPICAL PERFORMANCE DATA

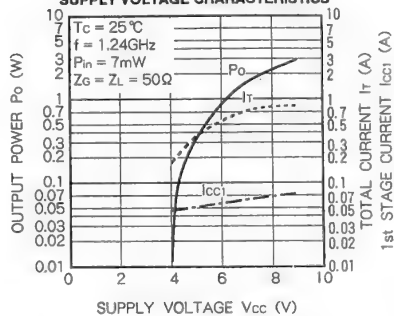
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR
VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, 2nd, 3rd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICSOUTPUT POWER, 2nd, 3rd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS

1240~1300MHz, 7.2V, 1W, FM PORTABLE RADIO

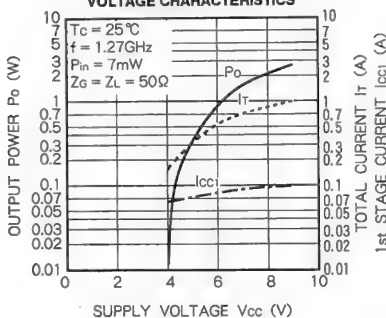
OUTPUT POWER, 2nd, 3rd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



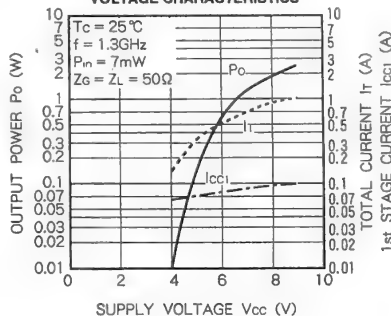
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



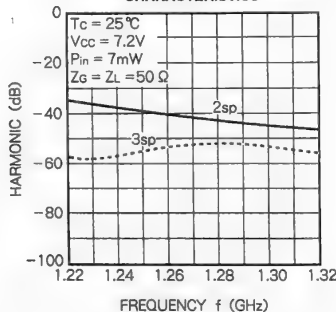
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



2nd, 3rd HARMONIC VS. FREQUENCY
CHARACTERISTICS

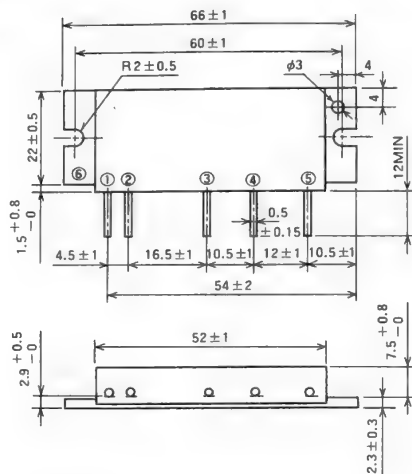


M67736

896~941MHz, 12.5V, 12W, FM MOBILE RADIO

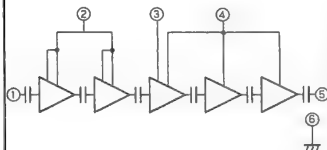
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ① PIN : RF INPUT
- ② VCC1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS SUPPLY
- ④ VCC2 : 2nd. DC SUPPLY
- ⑤ PO : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

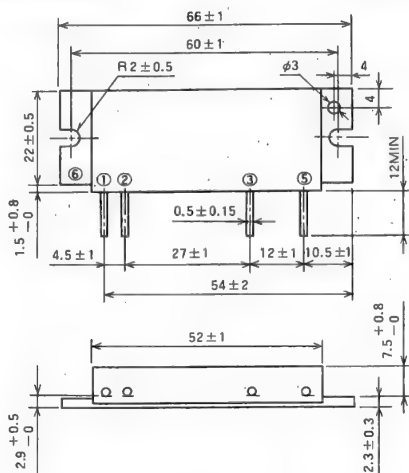
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC1}	Supply voltage		13	V
V _{BB}	Base bias		9	V
V _{CC2}	Supply voltage		17	V
I _{CC}	Total current		5	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, V _{CC1} ≤ 12.5V, V _{BB} = 8V	10	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	20	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	V _{CC1} = V _{CC2} = 12.5V V _{BB} = 8V P _{in} = 5mW Z _G = Z _L = 50 Ω	896-902, 935-941		MHz
P _o	Output power		12		W
η _T	Total efficiency		30		%
2f _o	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	P _o = 15W (V _{CC1} : controlled) V _{BB} = 8V, V _{CC2} = 15.2V P _{in} = 5mW, Z _G = 50 Ω Load VSWR = 20:1 (All phase), 5sec.	No degradation		-

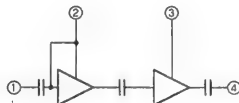
OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



PIN :

① P_{in} : RF INPUT

② V_{CC1} : 1st. DC SUPPLY

③ VCC2 : 2nd. DC SUPPLY

④ Po : RF OUTPUT

⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

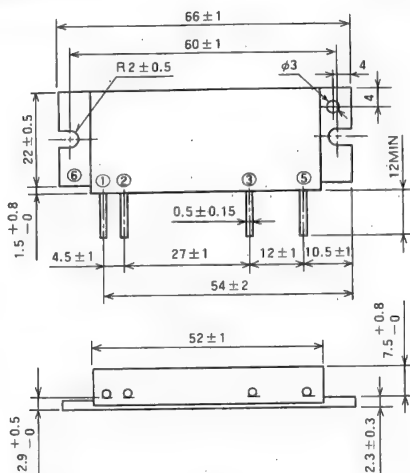
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		17	V
I _{cc}	Total current		7	A
P _{in(max)}	Input power	Z _o = Z _L = 50 Ω	0.5	W
P _{o(max)}	Output power	Z _o = Z _L = 50 Ω	35	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f'	Frequency range	$P_{in} = 0.2W$ $V_{cc} = 12.5V$ $Z_6 = Z_L = 50 \Omega$	135	160	MHz
Po'	Output power		30		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			- 25	dB
3fo	3rd. harmonic			- 30	dB
ρ_{in}	Input VSWR			3.3	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 30W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_6 = 50 \Omega$	No degradation		-

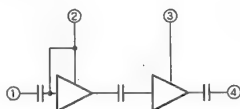
OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



PIN:

- ①Pin : RF INPUT
②VCC1 : 1st. DC SUPPLY
③VCC2 : 2nd. DC SUPPLY
④Po : RF OUTPUT
⑤GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C unless otherwise noted)

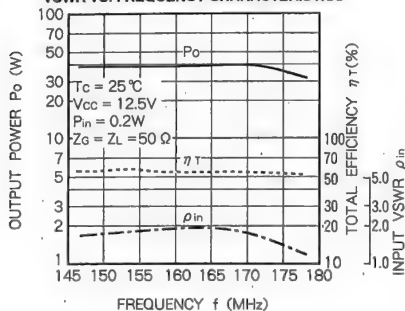
Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		7	A
P _{in(max)}	Input power	Z _α = Z _L = 50 Ω	0.5	W
P _{o(max)}	Output power	Z _α = Z _L = 50 Ω	35	W
T _{c(OP)}	Operation case temperature		- 30 ~ 110	°C
T _{sto}	Storage temperature		- 40 ~ 110	°C

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

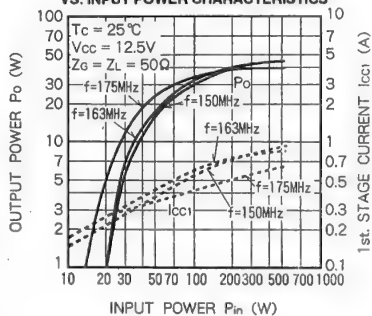
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.2W$ $V_{cc} = 12.5V$ $Z_G = Z_L = 50 \Omega$	150	175	MHz
P_o	Output power		30		W
η_T	Total efficiency		40		%
$2f_o$	2nd. harmonic			- 25	dB
$3f_o$	3rd. harmonic			- 30	dB
ρ_{in}	Input VSWR			3.3	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$ $P_o = 30W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

TYPICAL PERFORMANCE DATA

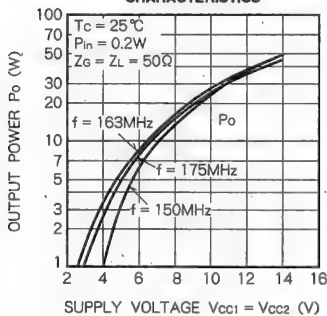
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



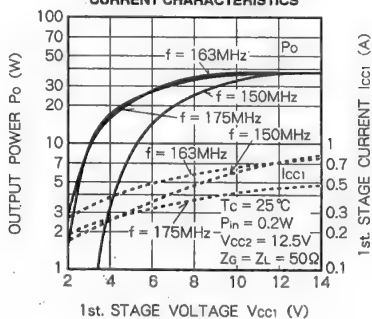
OUTPUT POWER, 1st. STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



OUTPUT POWER VS. SUPPLY VOLTAGE CHARACTERISTICS

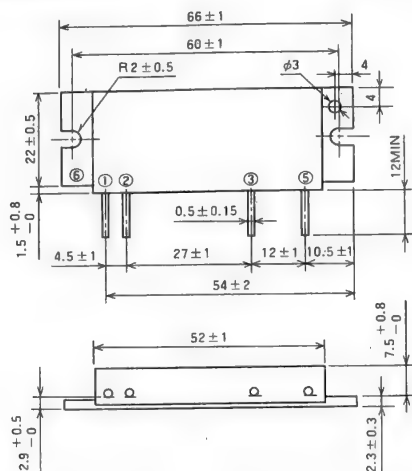


OUTPUT POWER VS. 1st STAGE CURRENT CHARACTERISTICS



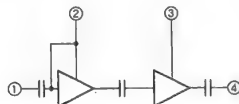
OUTLINE DRAWING

Dimensions in mm



H2

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vcc2 : 2nd. DC SUPPLY
④Po : RF OUTPUT
⑤GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		17	V
I _{CC}	Total current		10	A
P _{in(max)}	Input power	Z _α = Z _L = 50 Ω	0.8	W
P _{O(max)}	Output power	Z _α = Z _L = 50 Ω	40	W
T _{C(OP)}	Operation case temperature		- 30~110	°C
T _{stg}	Storage temperature		- 40~110	°C

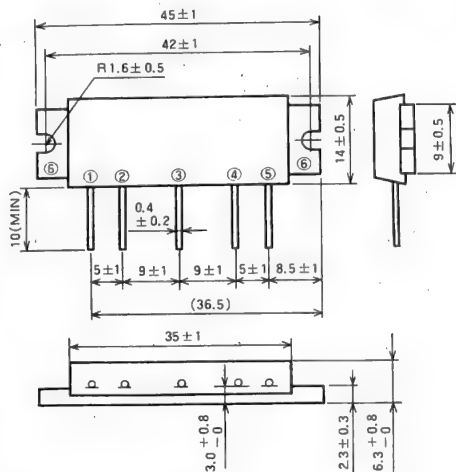
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 0.5W$ $V_{oc} = 12.5V$ $Z_o = Z_L = 50 \Omega$	68	88	MHz
Po	Output power		30		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			- 25	dB
3fo	3rd. harmonic			- 30	dB
ρ_{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	$V_{cc} = 15.2V$, $P_o = 30W$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_o = 50 \Omega$	No degradation		-

M67743L

68-81MHz, 12.5V, 7W, FM PORTABLE RADIO

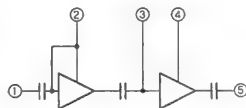
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vbb : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

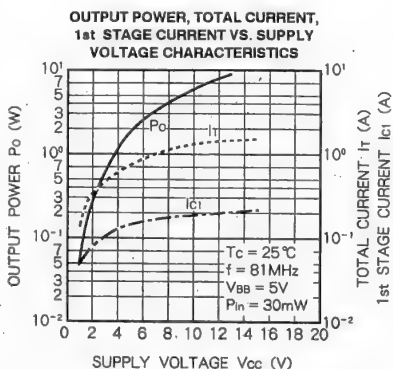
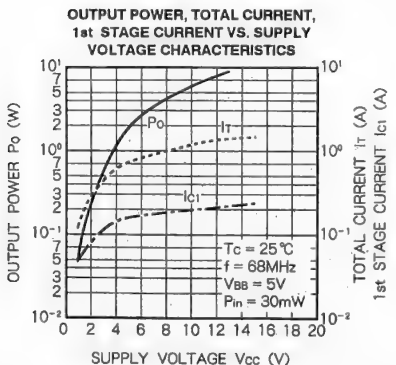
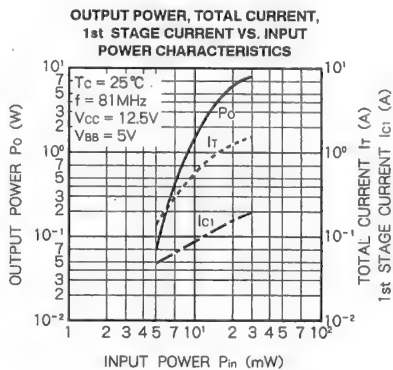
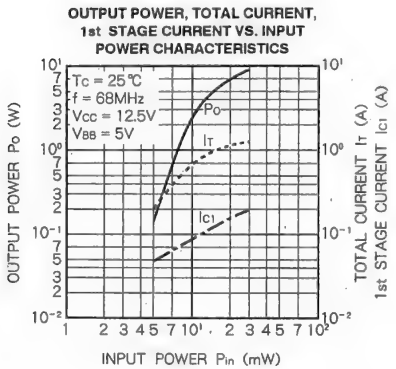
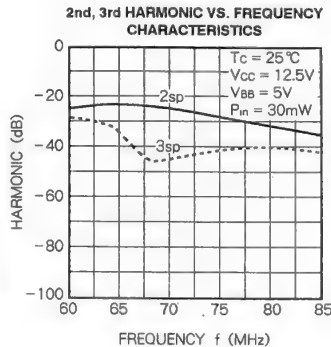
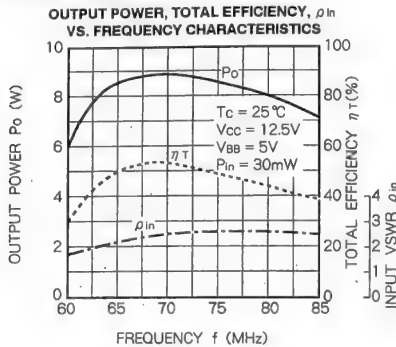
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		15	V
Vbb			5.5	V
Icc	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
Tc(op)	Operation case temperature		-30~110	°C
Tstg	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

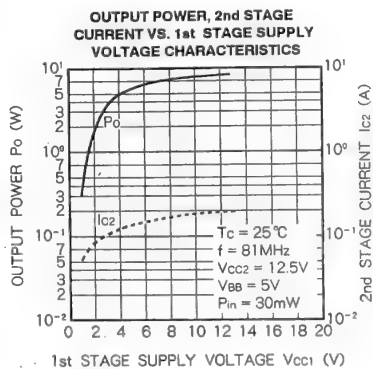
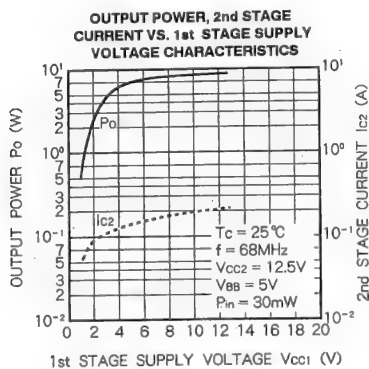
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		68	81	MHz
P _o	Output power	P _{in} = 30mW	7		W
η _T	Total efficiency	V _{bb} = 5V	38		%
2f ₀	2nd. harmonic	V _{cc} = 12.5V		-18	dB
3f ₀	3rd. harmonic	Z ₀ = Z _L = 50 Ω		-25	dB
ρ _{in}	Input VSWR			4.0	-
-	Load VSWR tolerance	V _{cc} = 13.2V, V _{bb} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		-

68-81MHz, 12.5V, 7W, FM PORTABLE RADIO

TYPICAL PERFORMANCE DATA

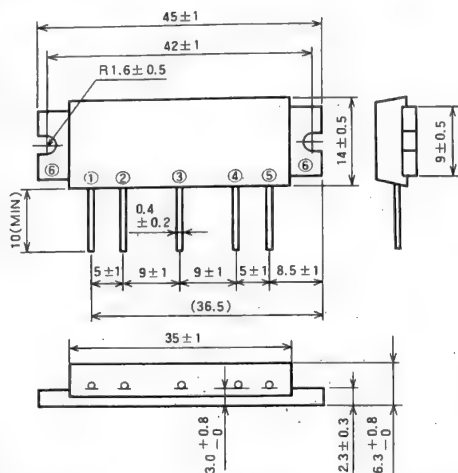


68-81MHz, 12.5V, 7W, FM PORTABLE RADIO



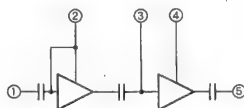
OUTLINE DRAWING

Dimensions in mm



H13

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vbb : BASE BIAS
④Vcc2 : 2nd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		15	V
V _{BB}			5.5	V
I _{CC}	Total current		4	A
P _{IN(max)}	Input power	Z _G = Z _L = 50 Ω	40	mW
P _{O(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{C(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

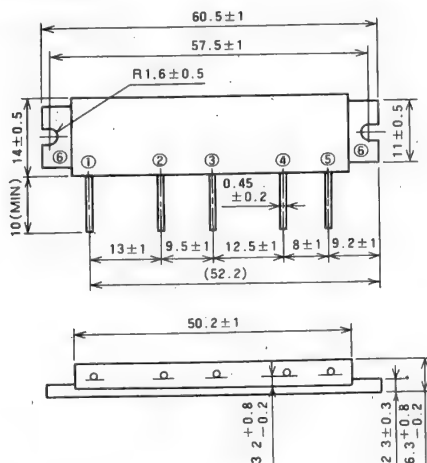
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 30\text{mW}$ $V_{AB} = 5\text{V}$ $V_{CC} = 12.5\text{V}$ $Z_0 = Z_L = 50\ \Omega$	77	88	MHz
P_o	Output power		7		W
η_T	Total efficiency		38		%
2fo	2nd. harmonic			- 18	dB
3fo	3rd. harmonic			- 25	dB
ρ_{in}	Input VSWR			5.0	-
-	Load VSWR tolerance	$V_{CC} = 13.2\text{V}$, $V_{AB} = 5\text{V}$ $P_o = 7\text{W}$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50\ \Omega$	No degradation		-

M67745

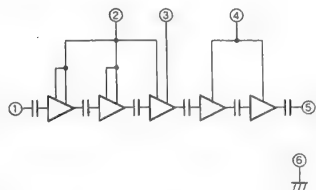
846~903MHz, 12.5V, 7W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM

PIN:

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

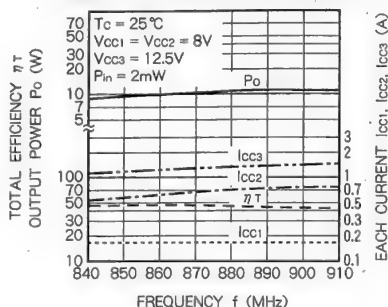
Symbol	Parameter	Conditions	Ratings	Unit
$V_{cc1, 2}$	Supply voltage		9	V
V_{cc3}			17	V
I_{cc}	Total current		4	A
$P_{in(max)}$	Input power	$f=846\sim 903\text{MHz}$, $V_{cc1} \leq 8\text{V}$, $Z_0=Z_L=50\Omega$	7	mW
$P_{o(max)}$	Output power	Ditto	10	W
$T_C(OP)$	Operation case temperature		$-30\sim 110$	$^\circ\text{C}$
T_{stg}	Storage temperature		$-40\sim 110$	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

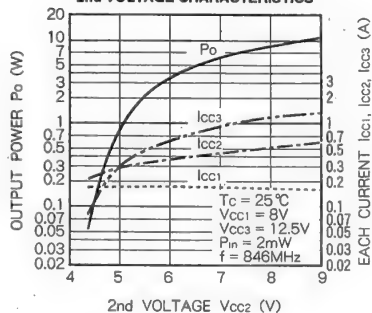
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$V_{cc1} = V_{cc2} = 8\text{V}$	846	903	MHz
P_o	Output power	$V_{cc3} = 12.5\text{V}$	7		W
η_T	Total efficiency	$P_{in} = 2\text{mW}$	35		%
$2f_o$	2nd. harmonic	$Z_0 = Z_L = 50\Omega$		-30	dB
ρ_{in}	Input VSWR			2.8	—
—	Load VSWR tolerance	$V_{cc1} = 8\text{V}$, $V_{cc3} = 15.2\text{V}$ $P_o = 7\text{W}$ (V_{cc2} : controlled) $P_{in} = 2\text{mW}$ Load VSWR=20:1 (All phase), 5sec.	No degradation		—

TYPICAL PERFORMANCE DATA

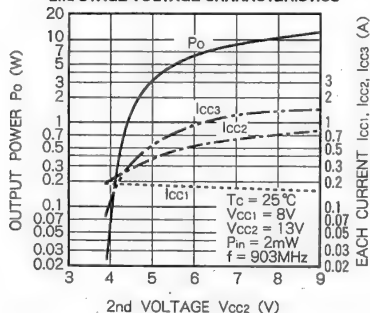
TOTAL EFFICIENCY, OUTPUT POWER, EACH CURRENT VS. FREQUENCY CHARACTERISTICS



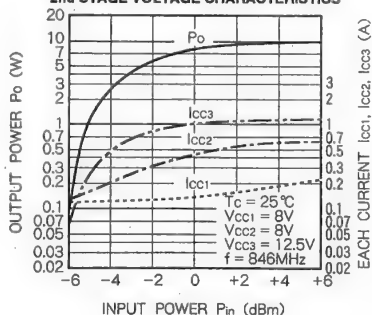
OUTPUT POWER, EACH CURRENT VS. 2nd VOLTAGE CHARACTERISTICS



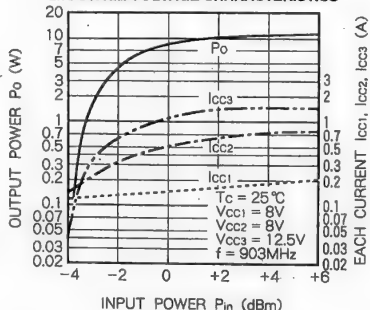
OUTPUT POWER, EACH STAGE CURRENT VS. 2nd STAGE VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH STAGE CURRENT VS. 2nd STAGE VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH STAGE CURRENT VS. 2nd STAGE VOLTAGE CHARACTERISTICS

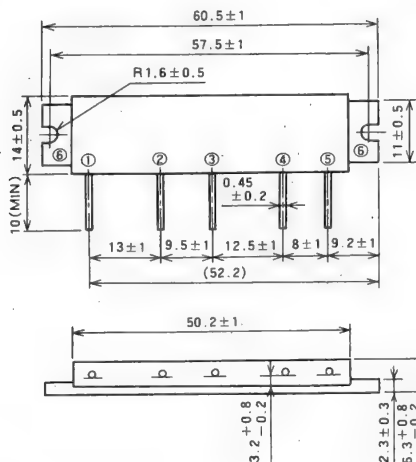


M67747A

898~925MHz, 12.5V, 7W, FM MOBILE RADIO

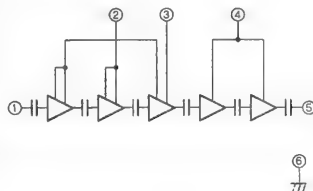
OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

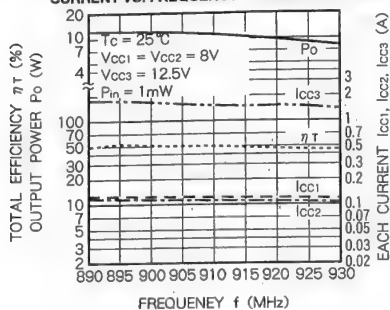
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1, 2	Supply voltage		9	V
Vcc3			17	V
Icc	Total current		4	A
P _{in(max)}	Input power	f=846~925MHz, Vcc1 ≤ 8V, Z ₀ =Z _L =50 Ω	10	mW
P _{o(max)}	Output power	Ditto	10	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

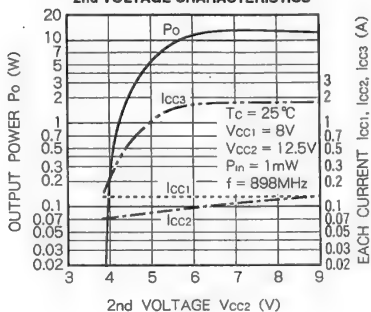
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = 8V, Vcc3 = 12.5V	898	925	MHz
P _o	Output power	P _{in} = 1mW, Z ₀ = Z _L = 50 Ω	7		W
η _T	Total efficiency	Vcc1 = 8V, P _o = 6W (Vcc2 : controlled)	35		%
2f ₀	2nd. harmonic	Vcc3 = 12.5V, P _{in} = 1mW		-30	dB
ρ _{in}	Input VSWR	Z ₀ = Z _L = 50 Ω		2.5	—
—	Load VSWR tolerance	Vcc1 = 8V, Vcc3 = 15.2V P _o = 6W (Vcc2 : controlled) P _{in} = 1mW Load VSWR=20:1 (All phase), 5sec.	No degradation		—

TYPICAL PERFORMANCE DATA

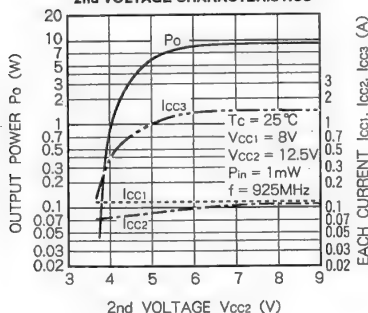
TOTAL EFFICIENCY, OUTPUT POWER, EACH CURRENT VS. FREQUENCY CHARACTERISTICS



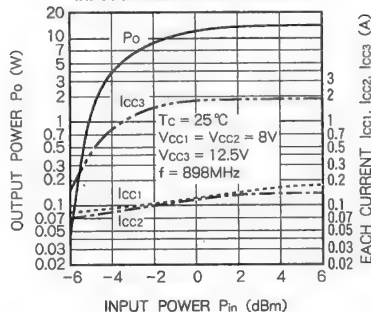
OUTPUT POWER, EACH CURRENT VS. 2nd VOLTAGE CHARACTERISTICS



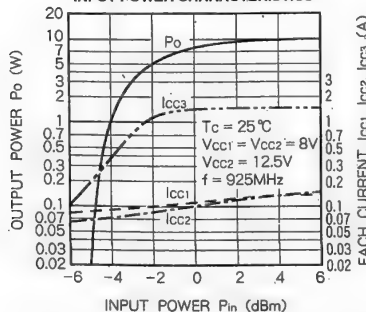
OUTPUT POWER, EACH CURRENT VS. 2nd VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH CURRENT VS. INPUT POWER CHARACTERISTICS

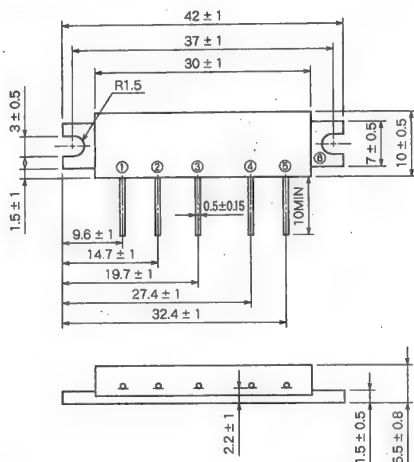


OUTPUT POWER, EACH CURRENT VS. INPUT POWER CHARACTERISTICS



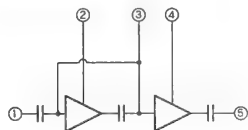
OUTLINE DRAWING

Dimensions in mm



H27

BLOCK DIAGRAM



PIN :

①Po : RF INPUT

②Vcc2 : 2nd. DC SUPPLY

③Vbb : BASE BIAS

④Vcc1 : 1st. DC SUPPLY

⑤Po : RF OUTPUT

⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

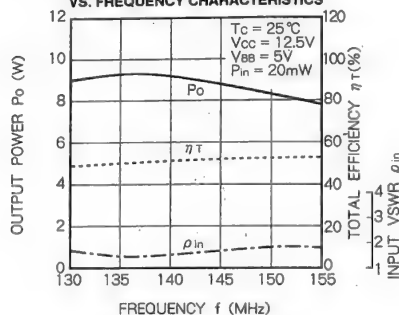
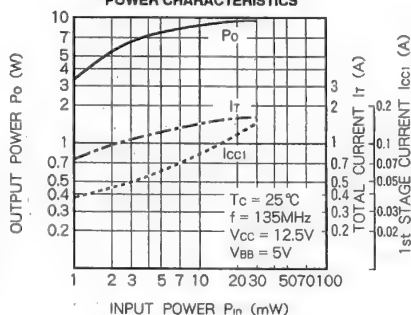
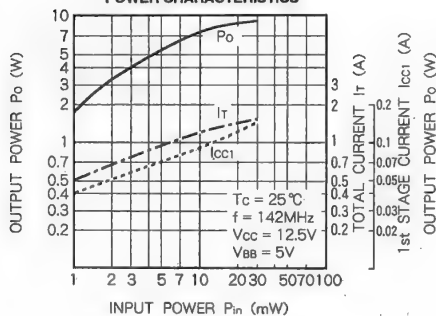
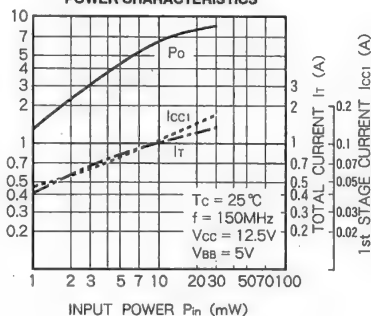
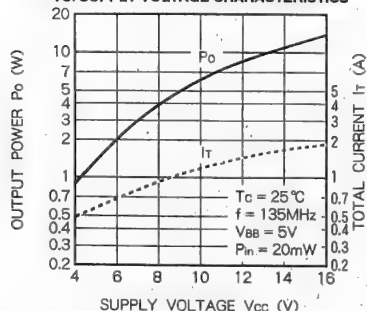
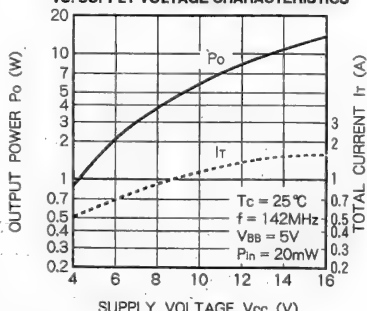
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		15	V
Vbb			5.5	V
Icc	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		135	150	MHz
P _o	Output power	P _{in} = 20mW	7		W
η _T	Total efficiency	V _{bb} = 5V	45		%
2f ₀	2nd. harmonic	Vcc = 12.5V		-20	dB
3f ₀	3rd. harmonic	Z ₀ = Z _L = 50 Ω		-25	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	Vcc2 = 13.2V, Vbb = 5V P _o = 7W (Vcc1 : controlled) P _{in} = 20mW Load VSWR = 20:1 (All phase), 2sec. Z ₀ = 50Ω	No degradation		—

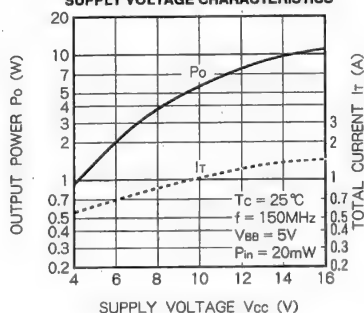
135~150MHz, 12.5V, 7W, FM PORTABLE RADIO

TYPICAL PERFORMANCE DATA

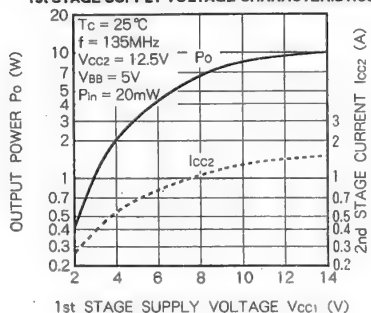
OUTPUT POWER, TOTAL EFFICIENCY, P_{in}
VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS

135-150MHz, 12.5V, 7W, FM PORTABLE RADIO

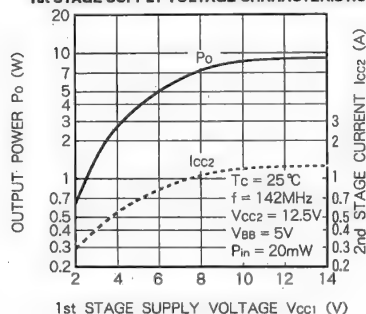
OUTPUT POWER, TOTAL CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



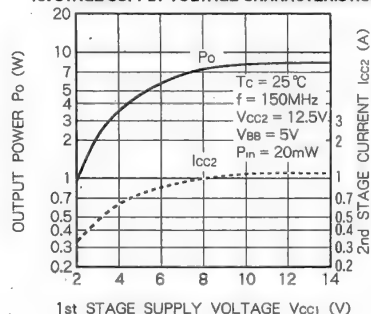
OUTPUT POWER, 2nd STAGE CURRENT, VS.
1st STAGE SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, 2nd STAGE CURRENT, VS.
1st STAGE SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, 2nd STAGE CURRENT, VS.
1st STAGE SUPPLY VOLTAGE CHARACTERISTICS

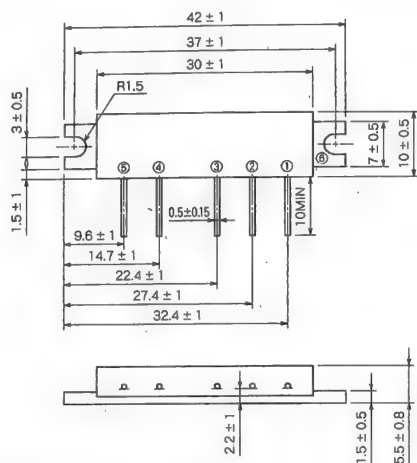


M67748LR

135~150MHz, 12.5V, 7W, FM PORTABLE RADIO

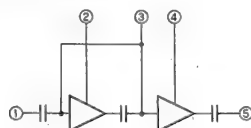
OUTLINE DRAWING

Dimensions in mm



H27R

BLOCK DIAGRAM



PIN:

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

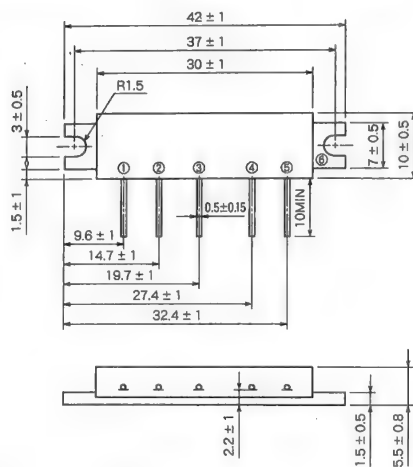
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage		15	V
V _{BB}			5.5	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		135	150	MHz
P _o	Output power	P _{in} = 20mW	7		W
η _T	Total efficiency	V _{BB} = 5V	45		%
2f _o	2nd. harmonic	V _{cc} = 12.5V		~ 20	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		~ 25	dB
ρ _{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	V _{cc2} = 13.2V, V _{BB} = 5V P _o = 7W (V _{cc2} controlled) P _{in} = 20mW Load VSWR = 20:1 (All phase), Z _{sec} . Z _G = 50Ω	No degradation		-

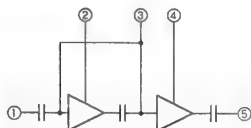
OUTLINE DRAWING

Dimensions in mm



H27

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②VCC2 : 2nd. DC SUPPLY
- ③VBB : BASE BIAS
- ④VCC1 : 1st. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		15	V
V _{BB}			5.5	V
I _{CC}	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
T _{C(OP)}	Operation case temperature		- 30 ~ 110	°C
T _{stg}	Storage temperature		- 40 ~ 110	°C

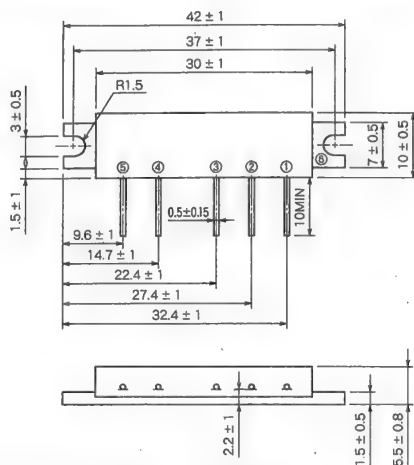
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 20\text{mW}$ $V_{BB} = 5\text{V}$ $V_{CC} = 12.5\text{V}$ $Z_0 = Z_L = 50\ \Omega$	150	174	MHz
Po	Output power		7		W
η_T	Total efficiency		45		%
2fo	2nd. harmonic			- 20	dB
3fo	3rd. harmonic			- 25	dB
ρ_{in}	Input VSWR			2.5	—
T	Load VSWR tolerance	$V_{CC2} = 13.2\text{V}$, $V_{BB} = 5\text{V}$ $P_o = 7\text{W}$ (V_{CC1} : controlled) $P_{in} = 20\text{mW}$ Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50\ \Omega$	No degradation		—

M67748HR

150~174MHz, 12.5V, 7W, FM PORTABLE RADIO

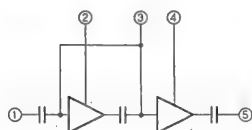
OUTLINE DRAWING

Dimensions in mm



H27R

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		15	V
VBB			5.5	V
Icc	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

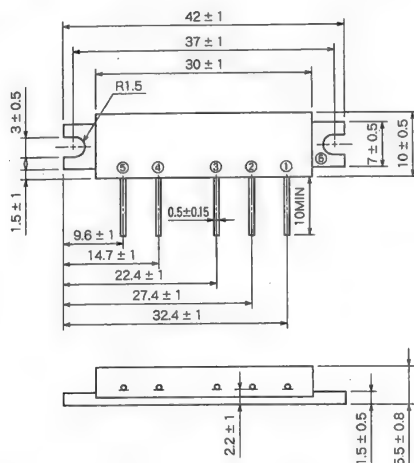
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		150	174	MHz
P _o	Output power	P _{in} = 20mW	7		W
η _T	Total efficiency	V _{BB} = 5V	45		%
2f ₀	2nd. harmonic	V _{cc} = 12.5V		-20	dB
3f ₀	3rd. harmonic	Z ₀ = Z _L = 50 Ω		-25	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	V _{cc2} = 13.2V, V _{BB} = 5V P _o = 7W (V _{cc1} : controlled) P _{in} = 20mW Load VSWR = 20:1 (All phase), 2sec. Z ₀ = 50 Ω	No degradation		—

M67749SLR

335~360MHz, 12.5V, 7W, FM PORTABLE RADIO

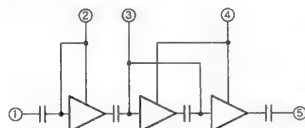
OUTLINE DRAWING

Dimensions in mm



H27R

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	Vbb ≤ 5V	16	V
Vbb		Vcc ≤ 12.5V	6	V
Icc	Total current		4	A
Pin(max)	Input power	Z0 = ZL = 50 Ω	40	mW
Po(max)	Output power	Z0 = ZL = 50 Ω	10	W
Tc(OP)	Operation case temperature		-30~110	°C
Tstg	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

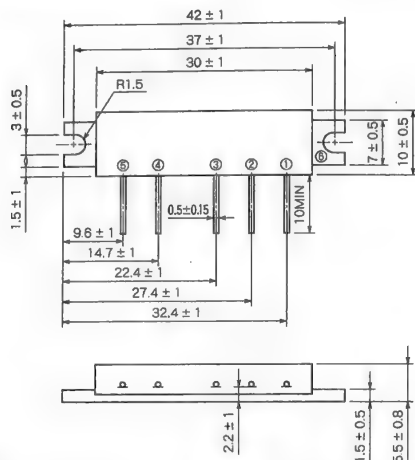
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		335	360	MHz
Po	Output power	Pin = 20mW	7		W
η _T	Total efficiency	Vbb = 5V	38		%
2fo	2nd. harmonic	Vcc = 12.5V		-25	dB
3fo	3rd. harmonic	Z0 = ZL = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	Vcc2 = 13.2V, Vbb = 5V Pin = 20mW Po = 7W (Vcc1 : controlled) Load VSWR = 20:1 (All phase), 2sec. Z0 = 50Ω	No degradation		—

M67749ULR

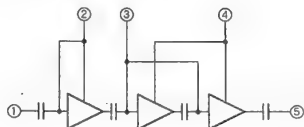
360~390MHz, 12.5V, 7W, FM PORTABLE RADIO

OUTLINE DRAWING

Dimensions in mm



H27R

BLOCK DIAGRAM

PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage	V _{BB} ≤ 5V	16	V
V _{BB}		V _{cc} ≤ 12.5V	6	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	40	mW
P _{O(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		- 30 ~ 110	°C
T _{stg}	Storage temperature		- 40 ~ 110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise noted)

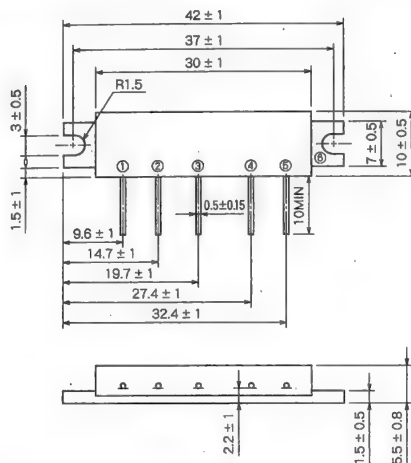
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		360	390	MHz
P _o	Output power	P _{in} = 20mW	7		W
η _T	Total efficiency	V _{BB} = 5V	38		%
2f _o	2nd. harmonic	V _{cc} = 12.5V		- 25	dB
3f _o	3rd. harmonic	Z ₀ = Z _L = 50 Ω		- 30	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	V _{cc2} = 13.2V, V _{BB} = 5V, P _{in} = 20mW P _o = 7W (V _{cc1} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z ₀ = 50Ω	No degradation		—

M67749L

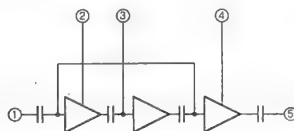
400~430MHz, 12.5V, 7W, FM PORTABLE RADIO

OUTLINE DRAWING

Dimensions in mm



H27

BLOCK DIAGRAM

PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

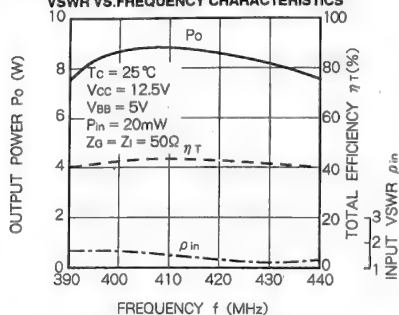
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage	V _{bb} ≤ 5V	16	V
V _{bb}		V _{cc} ≤ 12.5V	6	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z _o = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z _o = Z _L = 50 Ω	10	W
T _{c(op)}	Operation case temperature		- 30 ~ 110	°C
T _{stg}	Storage temperature		- 40 ~ 110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise noted)

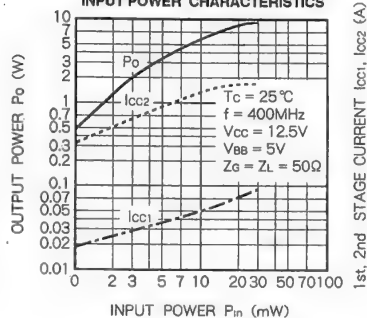
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		400	430	MHz
P _o	Output power	P _{in} = 20mW	7		W
η _T	Total efficiency	V _{bb} = 5V	35		%
2f _o	2nd. harmonic	V _{cc} = 12.5V		- 25	dB
3f _o	3rd. harmonic	Z _o = Z _L = 50 Ω		- 30	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	V _{cc2} = 13.2V, V _{bb} = 5V P _{in} = 20mW P _o = 7W (V _{cc1} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z _o = 50Ω	No degradation		—

TYPICAL PERFORMANCE DATA

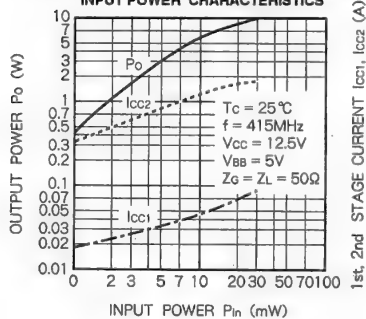
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



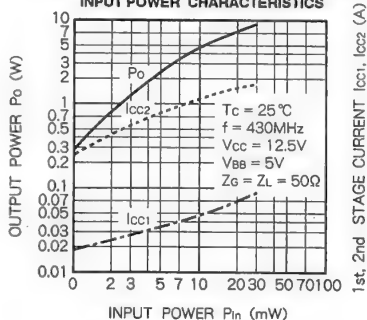
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



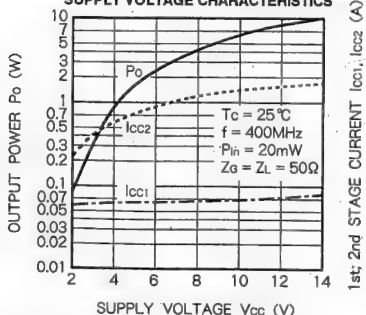
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



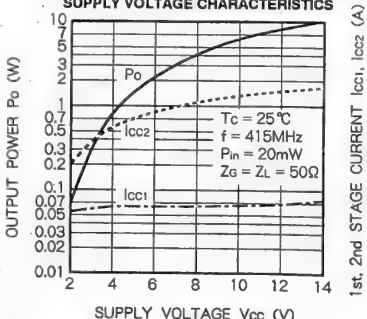
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. INPUT POWER CHARACTERISTICS



OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

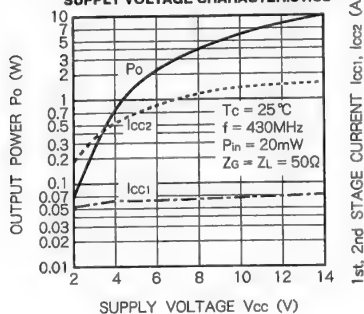


OUTPUT POWER, 1st, 2nd STAGE CURRENT VS. SUPPLY VOLTAGE CHARACTERISTICS

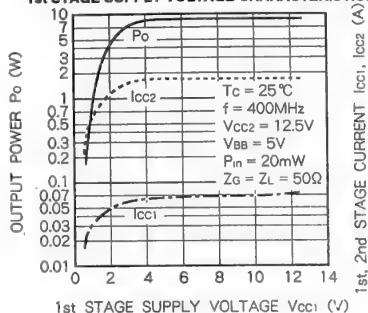


400-430MHz, 12.5V, 7W, FM PORTABLE RADIO

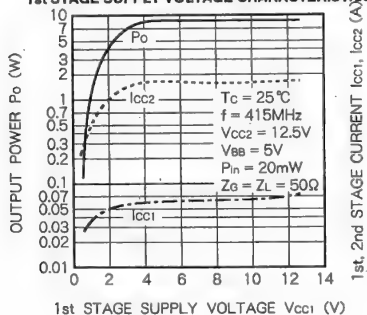
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS.
SUPPLY VOLTAGE CHARACTERISTICS



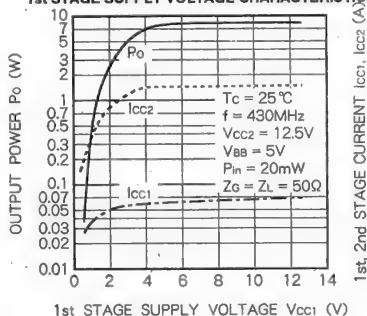
OUTPUT POWER, 1st, 2nd STAGE CURRENT VS.
1st STAGE SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, 1st, 2nd STAGE CURRENT VS.
1st STAGE SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, 1st, 2nd STAGE CURRENT VS.
1st STAGE SUPPLY VOLTAGE CHARACTERISTICS

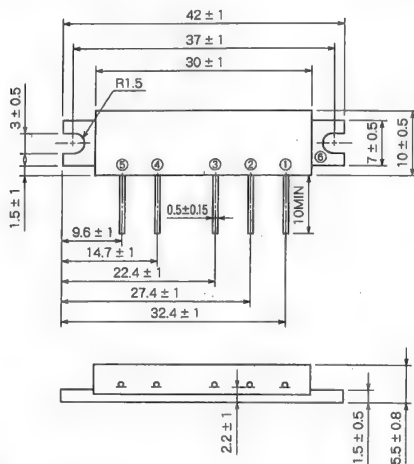


M67749LR

400~430MHz, 12.5V, 7W, FM PORTABLE RADIO

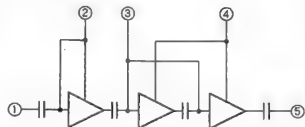
OUTLINE DRAWING

Dimensions in mm



H27R

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage	V _{bb} ≤ 5V	16	V
V _{bb}		V _{cc} ≤ 12.5V	6	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

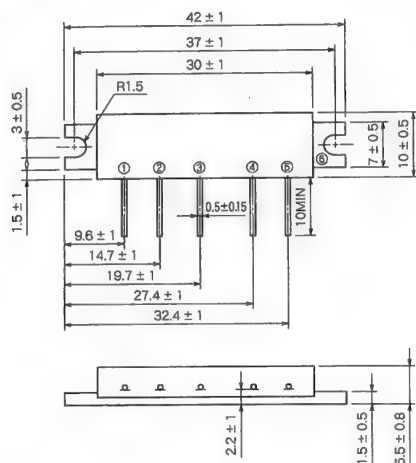
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		400	430	MHz
P _o	Output power	P _{in} = 20mW	7		W
η _T	Total efficiency	V _{bb} = 5V	38		%
2f _o	2nd. harmonic	V _{cc} = 12.5V		-25	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	V _{cc2} = 13.2V, V _{bb} = 5V, P _{in} = 20mW P _o = 7W (V _{cc1} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z _G = 50Ω	No degradation		—

M67749M

430~450MHz, 12.5V, 7W, FM PORTABLE RADIO

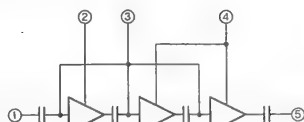
OUTLINE DRAWING

Dimensions in mm



H27

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③VBB : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	VBB ≤ 5V	16	V
VBB		Vcc ≤ 12.5V	6	V
Icc	Total current		4	A
Pin(max)	Input power	ZG = ZL = 50 Ω	40	mW
Po(max)	Output power	ZG = ZL = 50 Ω	10	W
Tc(op)	Operation case temperature		-30~110	°C
Tstg	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

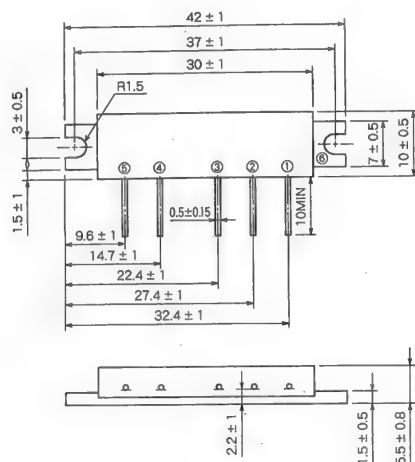
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		430	450	MHz
Po	Output power	Pin = 20mW	7		W
ηT	Total efficiency	VBB = 5V	40		%
2fo	2nd. harmonic	Vcc = 12.5V		-25	dB
3fo	3rd. harmonic	ZG = ZL = 50 Ω		-30	dB
ρin	Input VSWR			2.5	—
—	Load VSWR tolerance	Vcc2=13.2V, VBB=5V, Pin=20mW Po=7W (Vcc1: controlled) Load VSWR=20:1 (All phase), 2sec. ZG=50Ω	No degradation		—

M67749MR

430~450MHz, 12.5V, 7W, FM PORTABLE RADIO

OUTLINE DRAWING

Dimensions in mm

**H27R****BLOCK DIAGRAM**

PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

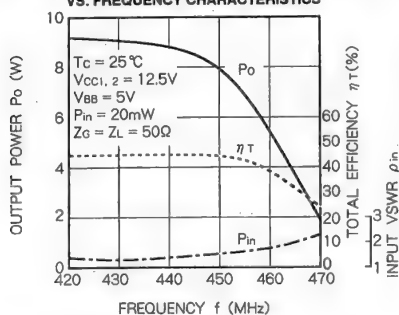
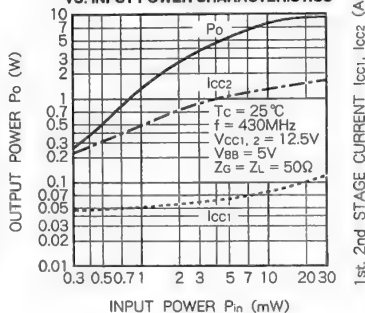
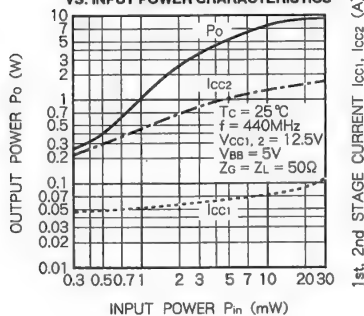
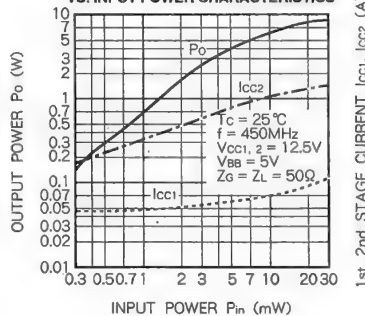
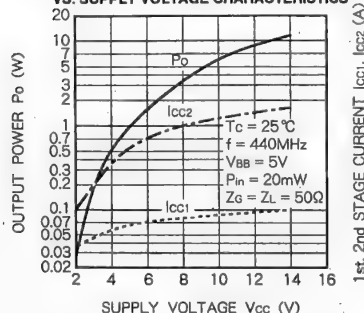
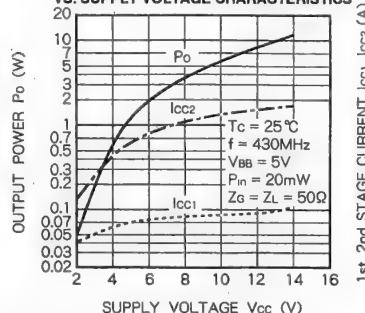
Symbol	Parameter	Conditions	Ratings	Unit
V _{cc}	Supply voltage	V _{BB} ≤ 5V	16	V
V _{BB}		V _{cc} ≤ 12.5V	6	V
I _{cc}	Total current		4	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω	40	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 20mW V _{BB} = 5V V _{cc} = 12.5V Z ₀ = Z _L = 50 Ω	430	450	MHz
P _o	Output power		7		W
η _T	Total efficiency		38		%
2f ₀	2nd. harmonic			-25	dB
3f ₀	3rd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	V _{cc2} = 13.2V, V _{BB} = 5V, P _{in} = 20mW P _o = 7W (V _{cc1} : controlled) Load VSWR=20:1 (All phase), 2sec. Z ₀ = 50Ω	No degradation		—

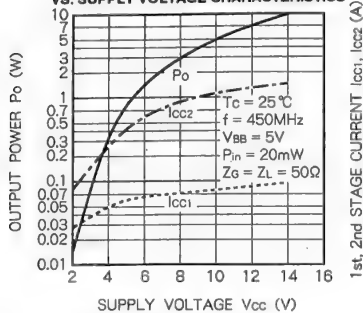
430~450MHz, 12.5V, 7W, FM PORTABLE RADIO

TYPICAL PERFORMANCE DATA

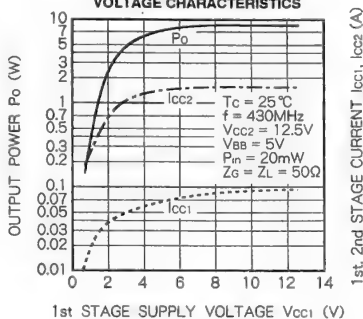
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR
VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS

430~450MHz, 12.5V, 7W, FM PORTABLE RADIO

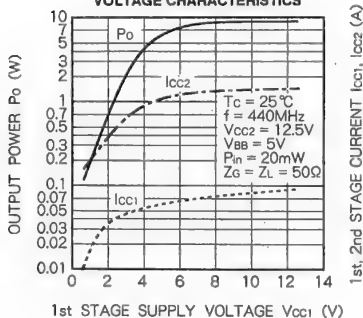
OUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS



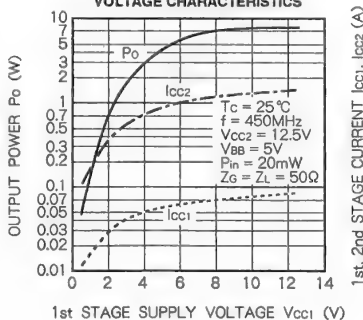
OUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, 1st, 2nd STAGE CURRENT
VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS

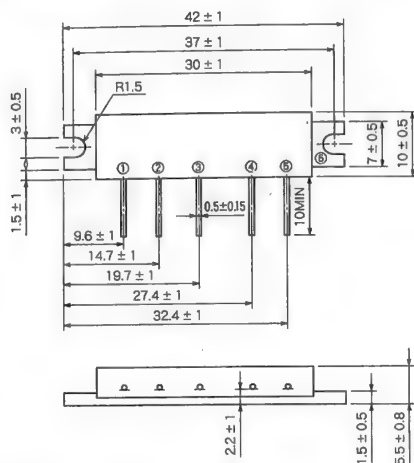


M67749H

440~470MHz, 12.5V, 7W, FM PORTABLE RADIO

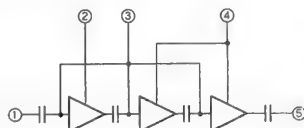
OUTLINE DRAWING

Dimensions in mm



H27

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	Vbb ≤ 5V	16	V
Vbb		Vcc ≤ 12.5V	6	V
Icc	Total current		4	A
Pin(max)	Input power	Z0 = ZL = 50 Ω	40	mW
Po(max)	Output power	Z0 = ZL = 50 Ω	10	W
Tc(OP)	Operation case temperature		-30~110	°C
Tstg	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

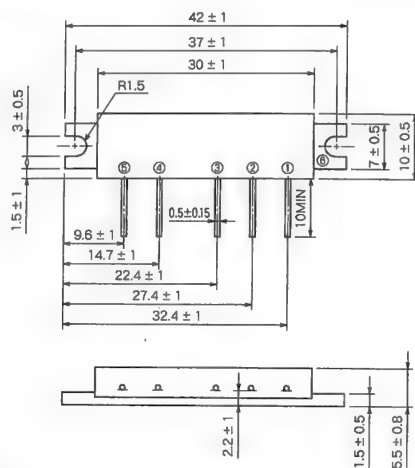
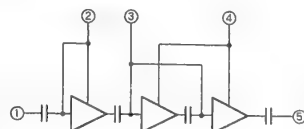
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		440	470	MHz
Po	Output power	Pin = 20mW	7		W
ηT	Total efficiency	Vbb = 5V	38		%
2fo	2nd. harmonic	Vcc = 12.5V		-25	dB
3fo	3rd. harmonic	Z0 = ZL = 50 Ω		-30	dB
ρin	Input VSWR			2.5	—
—	Load VSWR tolerance	Vcc2=13.2V, Vbb=5V, Pin=20mW Po=7W (Vcc1: controlled) Load VSWR=20:1 (All phase), 2sec. Z0=50Ω	No degradation		—

M67749HR

440~470MHz, 12.5V, 7W, FM PORTABLE RADIO

OUTLINE DRAWING

Dimensions in mm

**BLOCK DIAGRAM**

PIN :

- ① P_{in} : RF INPUT
- ② V_{CC1} : 1st. DC SUPPLY
- ③ V_{BB} : BASE BIAS
- ④ V_{CC2} : 2nd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage	V _{BB} ≤ 5V	16	V
V _{BB}		V _{CC} ≤ 12.5V	6	V
I _{CC}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	40	mW
P _{O(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

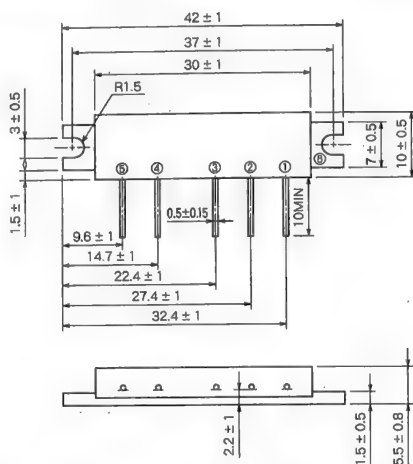
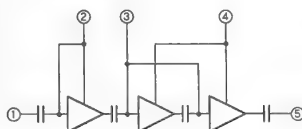
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		440	470	MHz
P _o	Output power	P _{in} = 20mW	7		W
η _T	Total efficiency	V _{BB} = 5V	38		%
2f _o	2nd. harmonic	V _{CC} = 12.5V		-25	dB
3f _o	3rd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	V _{CC2} = 13.2V, V _{BB} = 5V, P _{in} = 20mW P _o = 7W (V _{CC1} : controlled) Load VSWR = 20:1 (All phase), 2sec. Z _G = 50Ω	No degradation		—

M67749UHR

470~490MHz, 12.5V, 7W, FM PORTABLE RADIO

OUTLINE DRAWING

Dimensions in mm

**H27R****BLOCK DIAGRAM**

PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

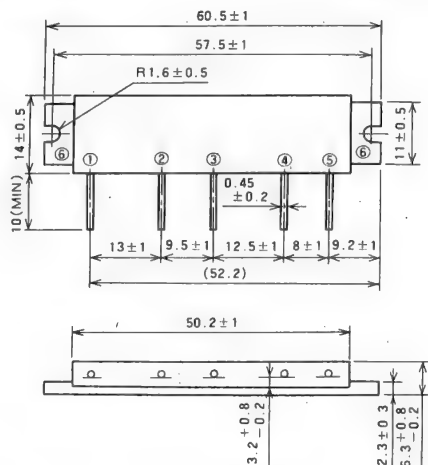
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage	VBB ≤ 5V	16	V
VBB		Vcc ≤ 12.5V	6	V
Icc	Total current		4	A
Pn(max)	Input power	ZG = ZL = 50 Ω	40	mW
Po(max)	Output power	ZG = ZL = 50 Ω	10	W
Tc(OP)	Operation case temperature		-30~110	°C
Tatg	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		470	490	MHz
Po	Output power	Pin = 20mW	7		W
ηT	Total efficiency	VBB = 5V	38		%
2fo	2nd. harmonic	Vcc = 12.5V		-25	dB
3fo	3rd. harmonic	ZG = ZL = 50 Ω		-30	dB
ρin	Input VSWR			2.5	—
—	Load VSWR tolerance	Vcc2 = 13.2V, VBB = 5V, Pin = 20mW Po = 7W (Vcc1 : controlled) Load VSWR = 20:1 (All phase), 2sec. ZG = 50Ω	No degradation		—

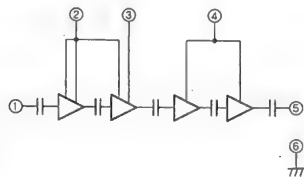
OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN:

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

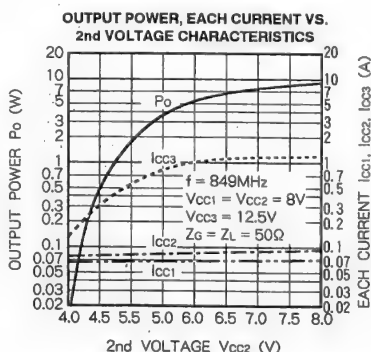
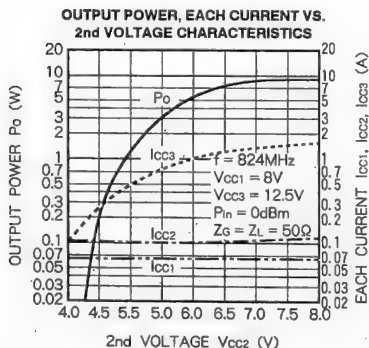
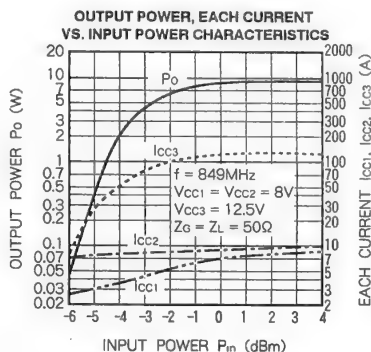
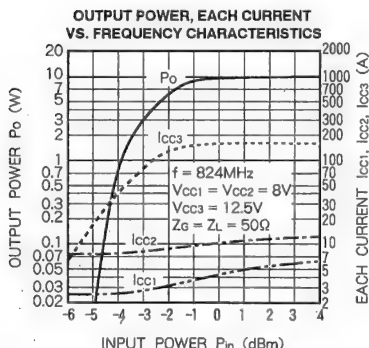
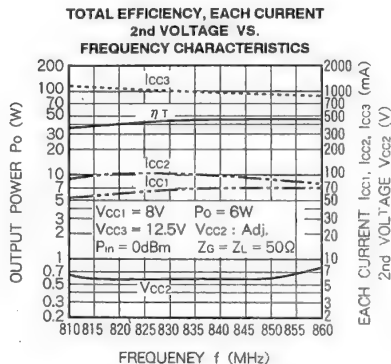
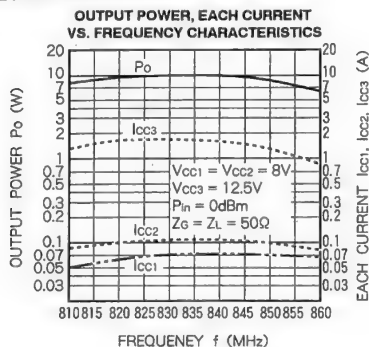
ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

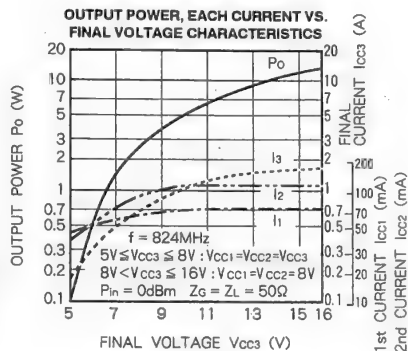
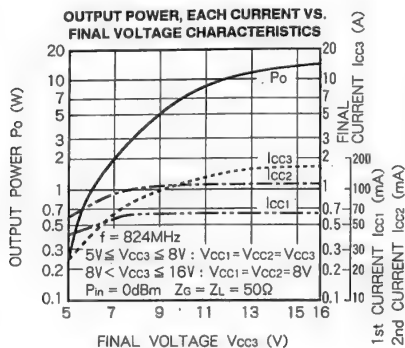
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1, 2	Supply voltage		9	V
Vcc3			17	V
Icc	Total current		4	A
P _{in(max)}	Input power	f=824~849MHz, Vcc1 ≤ 8V, Z ₀ =Z _L =50 Ω	10	mW
P _{o(max)}	Output power	Ditto	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = 8V, Vcc3 = 12.5V	824	849	MHz
P _o	Output power	P _{in} = 1mW, Z ₀ = Z _L = 50 Ω	6		W
η _T	Total efficiency	Vcc1 = 8V, P _o = 6W (Vcc2 : controlled)	35		%
2f _o	2nd. harmonic	Vcc3 = 12.5V, P _{in} = 1mW		-30	dB
ρ _{in}	Input VSWR	Z ₀ = Z _L = 50 Ω		2.5	—
—	Load VSWR tolerance	Vcc1 = 8V, Vcc3 = 15.2V P _o = 6W (Vcc2 : controlled) P _{in} = 1mW Load VSWR=20:1 (All phase), 5sec.	No degradation		—

TYPICAL PERFORMANCE DATA



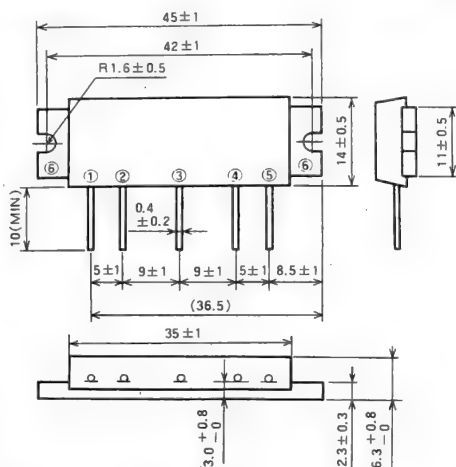


M67755L

134~150MHz, 7.2V, 7W, FM PORTABLE RADIO

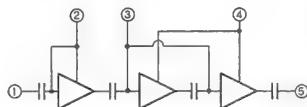
OUTLINE DRAWING

Dimensions in mm



H12

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② VCC1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS
- ④ VCC2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		10	V
Vbb			7	V
Icc	Total current		4	A
P _{in(max)}	Input power	$Z_G = Z_L = 50 \Omega$	4	mW
P _{o(max)}	Output power	$Z_G = Z_L = 50 \Omega$	10	W
T _{OP}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

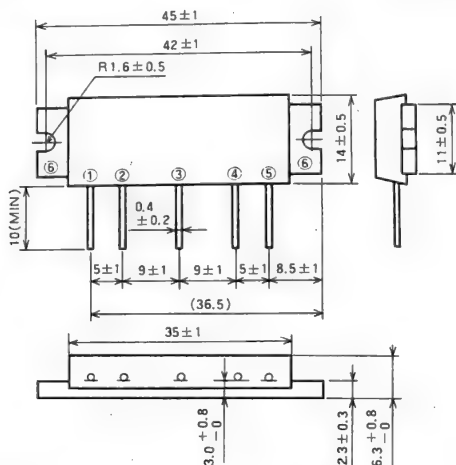
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 2\text{mW}$ $V_{BB} = 5\text{V}$ $V_{CC} = 7.2\text{V}$ $Z_G = Z_L = 50 \Omega$	134	150	MHz
P _o	Output power		7		W
η	Total efficiency		40		%
2f _o	2nd. harmonic			-25	dB
3f _o	3rd. harmonic			-30	dB
ρ_{in}	Input VSWR			3.5	-
-	Load VSWR tolerance	$V_{CC} = 9\text{V}$, $V_{BB} = 5\text{V}$ $P_o = 7\text{W}$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

M67755H

150~174MHz, 7.2V, 7W, FM PORTABLE RADIO

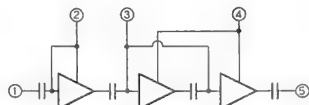
OUTLINE DRAWING

Dimensions in mm



H12

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vbb : BASE BIAS
- ④Vcc2 : 2nd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

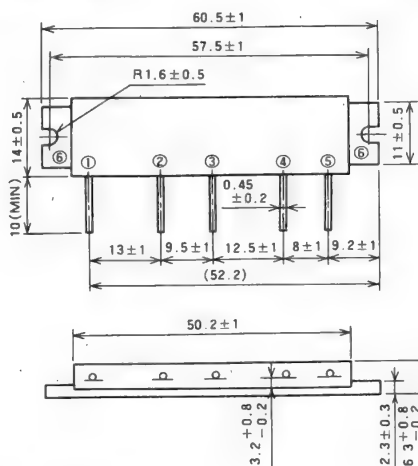
Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		9.2	V
Vbb			5.5	V
Icc	Total current		4	A
P _{in(max)}	Input power	$Z_G = Z_L = 50 \Omega$	4	mW
P _{o(max)}	Output power	$Z_G = Z_L = 50 \Omega$	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		150	174	MHz
P _o	Output power	P _{in} = 2mW.	7		W
η_T	Total efficiency	V _{bb} = 5V	40		%
2f _o	2nd. harmonic	Vcc = 7.2V		-25	dB
3f _o	3rd. harmonic	$Z_G = Z_L = 50 \Omega$		-30	dB
ρ_{in}	Input VSWR			3.5	-
-	Load VSWR tolerance	Vcc = 9V, V _{bb} = 5V P _o = 7W (P _{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

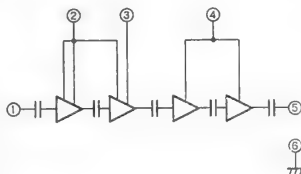
OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ① P_{in} : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

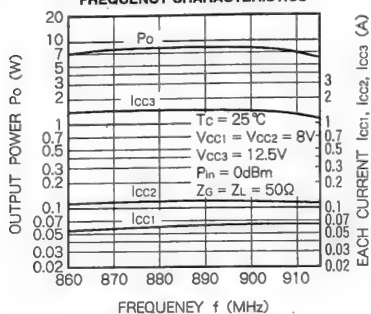
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1, 2	Supply voltage		9	V
Vcc3			17	V
Icc	Total current		4	A
P _{in(max)}	Input power	f=872~905MHz, Vcc1 ≤ 8V, Z ₀ =Z _L =50 Ω	10	mW
P _{o(max)}	Output power	Ditto	10	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

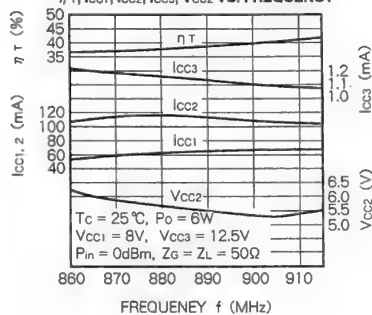
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = 8V, Vcc3 = 12.5V	872	905	MHz
P _o	Output power	P _{in} = 1mW, Z ₀ = Z _L = 50 Ω	6		W
η _T	Total efficiency	Vcc1 = 8V, P _o = 6W (Vcc2 : controlled)	35		%
2f _o	2nd. harmonic	Vcc3 = 12.5V, P _{in} = 1mW, Z ₀ = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	Vcc1 = 8V, Vcc3 = 15.2V, P _o = 6W (Vcc2 : controlled), P _{in} = 1mW, Load VSWR=20:1 (All phase), 5sec.	No degradation		—

TYPICAL PERFORMANCE DATA

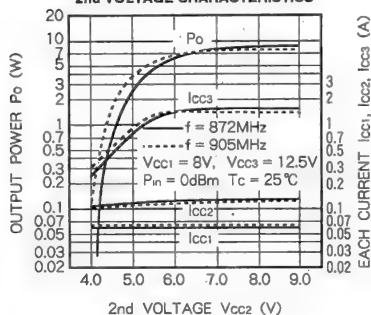
OUTPUT POWER, EACH CURRENT VS.
FREQUENCY CHARACTERISTICS



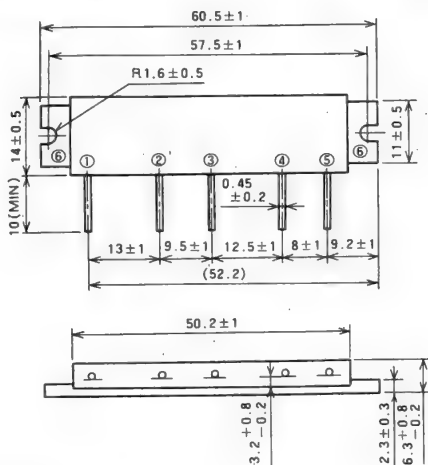
ηT , I_{cc1} , I_{cc2} , I_{cc3} , V_{cc2} VS. FREQUENCY



OUTPUT POWER, EACH CURRENT VS.
2nd VOLTAGE CHARACTERISTICS

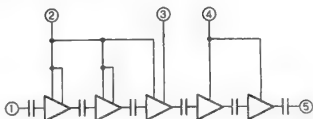


Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vcc2 : 2nd. DC SUPPLY
④Vcc3 : 3rd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Rating	Unit
V _{CC1, 2, 3}	Supply voltage		9, 2	V
I _{CC}	Total current	Z _G = Z _L = 50 Ω	4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, V _{CC1} ≤ 7.2V	7	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω, V _{CC1} ≤ 7.2V	9	W
T _{c(OP)}	Operation case temperature	Z _G = Z _L = 50 Ω, V _{CC1} ≤ 7.2V	− 30~100	°C
T _{stg}	Storage temperature		− 40~+110	°C

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

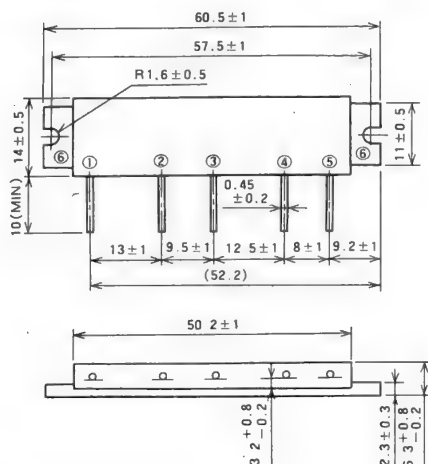
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 1\text{ mW}$ $V_{cc1} = V_{cc2} = V_{cc3} = 7.2\text{ V}$ $Z_0 = Z_L = 50\ \Omega$	893	901	MHz
Po	Output power		7		W
η_T	Total efficiency		35		%
2fo	2nd. harmonic			- 30	dBc
3fo	3rd. harmonic			- 30	dBc
ρ_{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	$V_{cc2} = V_{cc3} = 9.2\text{ V}$, $P_o = 7\text{ W}$ (V_{cc1} : controlled), Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50\ \Omega$	No degradation in output power		—

M67764

940~960MHz, 12.5V, 8W, FM MOBILE RADIO

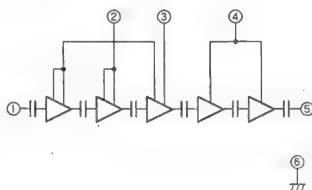
OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

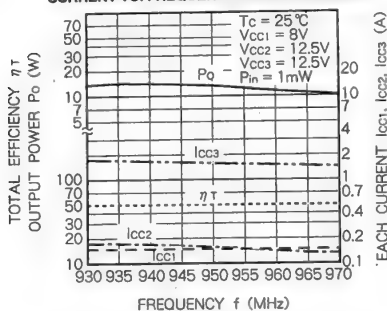
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	Supply voltage		9	V
Vcc2			14	V
Vcc3			17	V
Icc	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, Vcc1 ≤ 8V	7	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	12	W
T _{c(OP)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

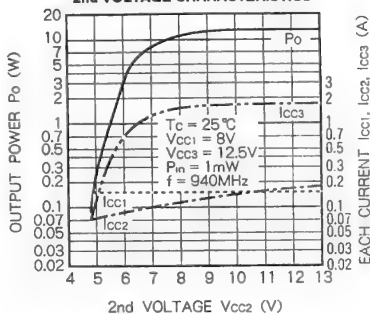
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = 8V	940	960	MHz
P _o	Output power	Vcc2 = Vcc3 = 12.5V	8		W
η _T	Total efficiency	P _{in} = 1mW	35		%
2f _o	2nd. harmonic	Z _G = Z _L = 50 Ω		-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	Vcc1 = 8V, Vcc3 = 15.2V P _o = 8W (Vcc2 : controlled) P _{in} = 1mW Load VSWR=20:1 (All phase), 5sec.	No degradation		-

TYPICAL PERFORMANCE DATA

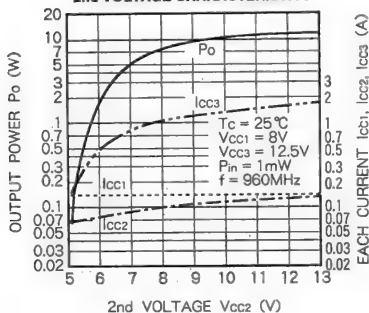
TOTAL EFFICIENCY, OUTPUT POWER, EACH CURRENT VS. FREQUENCY CHARACTERISTICS



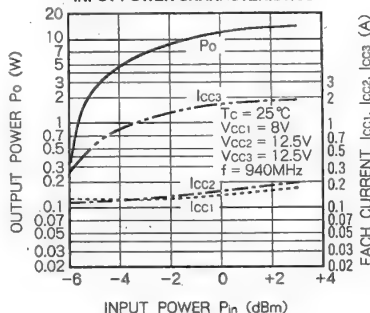
OUTPUT POWER, EACH CURRENT VS. 2nd VOLTAGE CHARACTERISTICS



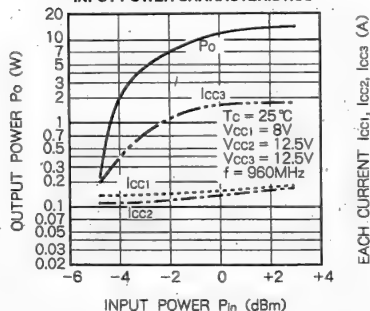
OUTPUT POWER, EACH CURRENT VS. 2nd VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH CURRENT VS. INPUT POWER CHARACTERISTICS

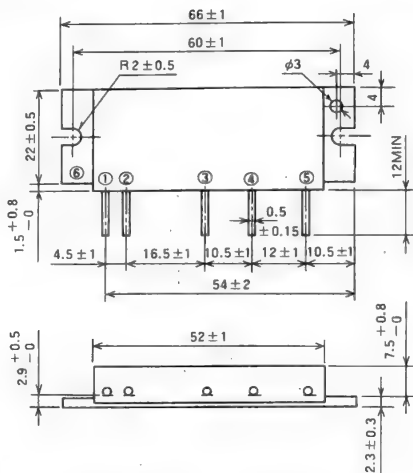


OUTPUT POWER, EACH CURRENT VS. INPUT POWER CHARACTERISTICS



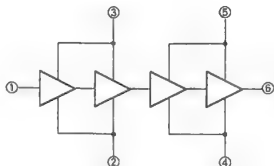
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN ·

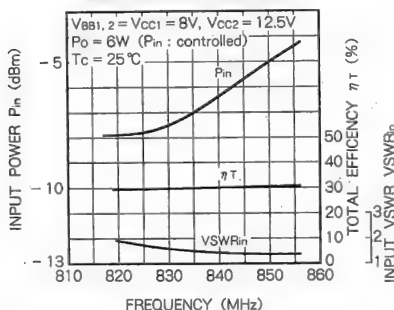
- ①P_{in} : RF INPUT
- ②V_{BB1} : 1st. BASE BIAS SUPPLY
- ③V_{CC1} : 1st. COLLECTOR BIAS SUPPLY
- ④V_{BB2} : 2nd. BASE BIAS SUPPLY
- ⑤V_{CC2} : 2nd. COLLECTOR BIAS SUPPLY
- ⑥P_o : RF OUTPUT
- ⑦GND : FIN

Symbol	Parameter	Conditions	Rating	Unit
V _{CC1}	1st. Collector bias supply voltage	Z _G = Z _L = 50 Ω, V _{BB1} = 8V	9	V
V _{CC2}	2nd. Collector bias supply voltage	Z _G = Z _L = 50 Ω, V _{BB2} = 8V	17	V
V _{BB1}	1st. Base bias supply voltage	Z _G = Z _L = 50 Ω, V _{CC1} = 8V	9	V
V _{BB2}	2nd. Base bias supply voltage	Z _G = Z _L = 50 Ω, V _{CC2} = 12.5V	9	V
I _{CC1}	1st. Collector DC current	Z _G = Z _L = 50 Ω	300	mA
I _{CC2}	2nd. Collector DC current	Z _G = Z _L = 50 Ω	2	A
I _{BB1}	1st. Base DC current	Z _G = Z _L = 50 Ω	200	mA
I _{BB2}	2nd. Base DC current	Z _G = Z _L = 50 Ω	300	mA
P _{i(av)}	Average input power	Z _G = Z _L = 50 Ω, V _{CC2} = 12.5V	4	mW
P _{i(pk)}	Peak input power	Z _G = Z _L = 50 Ω, V _{CC2} = 12.5V	10	mW
P _{o(av)}	Average output power	Z _G = Z _L = 50 Ω, V _{CC2} = 12.5V	10	mW
P _{o(pk)}	Peak output power	Z _G = Z _L = 50 Ω, V _{CC2} = 12.5V	20	W
T _{c(op)}	Operation case temperature	Z _G = Z _L = 50 Ω	- 30~100	°C
T _{stg}	Storage temperature		- 30~100	°C

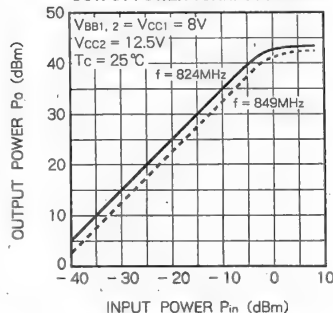
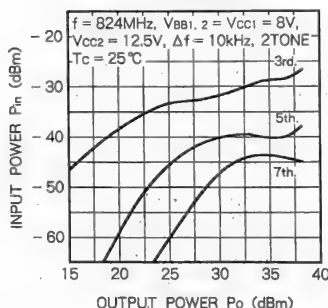
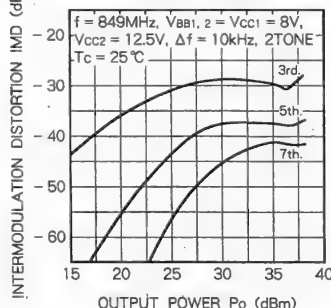
ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		824	849	MHz
$P_{o(pk)}$	Peak output power	$P_{i(pk)} = 2\text{mW}$, $V_{B1} = V_{B2} = 8\text{V}$, $V_{CC2} = 12.5\text{V}$, $Z_0 = Z_L = 50\Omega$	12.5		W
$P_{i(av)}$	Average output power			1	mW
η_T	Total efficiency	$V_{B1} = V_{CC1} = V_{B2} = 8\text{V}$, $V_{CC2} = 12.5\text{V}$	20		%
2fo	2nd. harmonic	$P_o = 6.0\text{W}$ (P_{in} : controlled)		-30	dBc
3fo	3rd. harmonic	$Z_0 = Z_L = 50\Omega$		-30	dBc
VSWR _{in}	Input VSWR			3:1	-
IMD ₃	3rd. IMD	$V_{B1} = V_{CC1} = V_{B2} = 8\text{V}$, $V_{CC2} = 12.5\text{V}$, $P_{o(av)} = 6.0\text{W}$ (P_{in} : controlled), $\Delta f = 10\text{kHz}$, 2 tone, $Z_0 = Z_L = 50\Omega$		-24	dBc
IMD ₅	5th. IMD			-32	dBc
IMD ₇	7th. IMD			-38	dBc
-	Load VSWR tolerance	$V_{B1} = V_{CC1} = V_{B2} = 8\text{V}$, $V_{CC2} = 15\text{V}$, $P_o = 6.0\text{W}$ (P_{in} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50\Omega$	No degradation in output power		-

TYPICAL PERFORMANCE DATA

INPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR VS. FREQUENCY

OUTPUT POWER VS. INPUT POWER

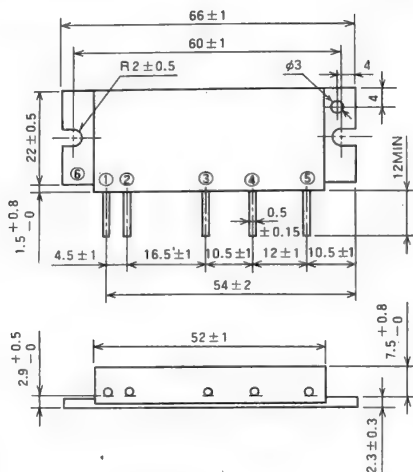
INTERMODULATION DISTORTION
VS. OUTPUT POWERINTERMODULATION DISTORTION
VS. OUTPUT POWER

M67769C

890~915MHz, 12.5V, 13W, FM MOBILE RADIO

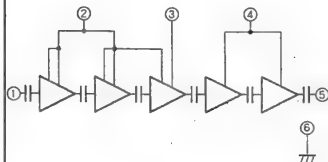
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN :

- ① P_{in} : RF INPUT
- ② V_{cc1} : 1st. DC SUPPLY
- ③ V_{cc2} : 2nd. DC SUPPLY
- ④ V_{cc3} : 3rd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

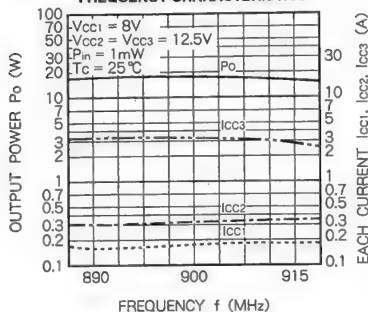
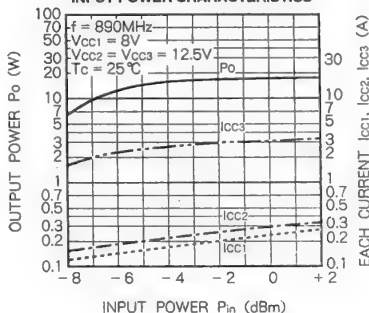
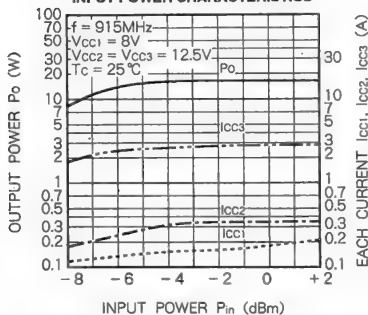
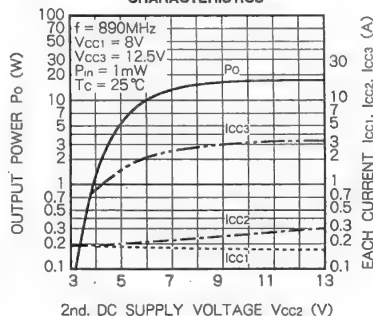
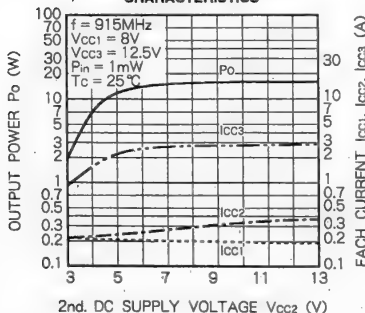
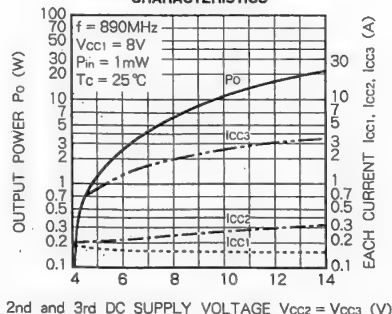
ABSOLUTE MAXIMUM RATINGS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc1}	Supply voltage		9	V
V _{cc2}			15	V
V _{cc3}			17	V
I _{cc}	Total current		5	A
P _{in(max)}	Input power	Z ₀ = Z _L = 50 Ω, V _{cc1} ≤ 8V	4	mW
P _{o(max)}	Output power	Z ₀ = Z _L = 50 Ω	20	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

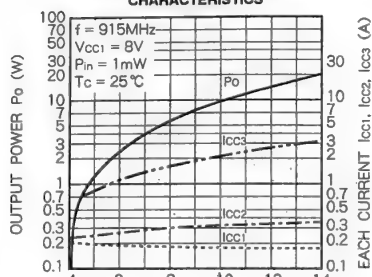
ELECTRICAL CHARACTERISTICS (T_c = 25°C unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	V _{cc1} = 8V V _{cc2} = V _{cc3} = 12.5V	890	915	MHz
P _o	Output power	P _{in} = 1mW	13		W
η _T	Total efficiency	Z ₀ = Z _L = 50 Ω	30		%
Z _{fo}	2nd. harmonic			-30	dB
ρ _{in}	Input VSWR			2.8	-
-	Load VSWR tolerance	V _{cc1} = 8V, V _{cc3} = 15.2V P _o = 13W (V _{cc2} : controlled) P _{in} = 1mW Load VSWR = 20:1 (All phase), 5sec.	No degradation		-

TYPICAL PERFORMANCE DATA

OUTPUT POWER, EACH CURRENT VS.
FREQUENCY CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
2nd. DC SUPPLY VOLTAGE
CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
2nd. DC SUPPLY VOLTAGE
CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
2nd and 3rd DC SUPPLY VOLTAGE
CHARACTERISTICS

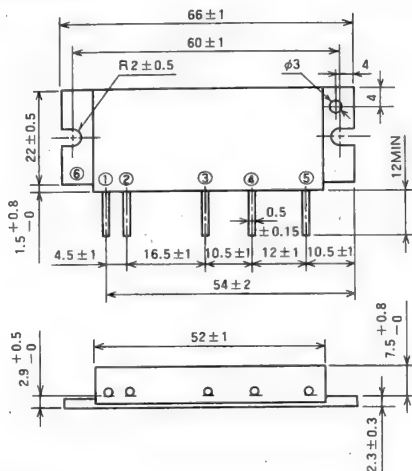
OUTPUT POWER, EACH CURRENT VS.
2nd and 3rd DC SUPPLY VOLTAGE
CHARACTERISTICS



2nd and 3rd DC SUPPLY VOLTAGE $V_{CC2} = V_{CC3}$ (V)

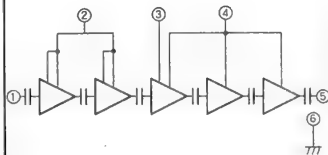
OUTLINE DRAWING

Dimensions in mm



H3

BLOCK DIAGRAM



PIN -

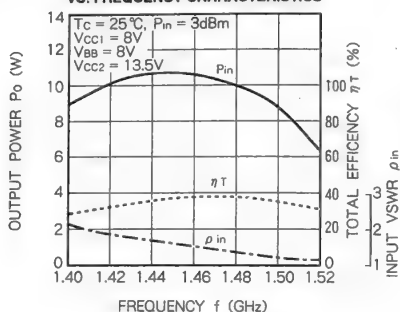
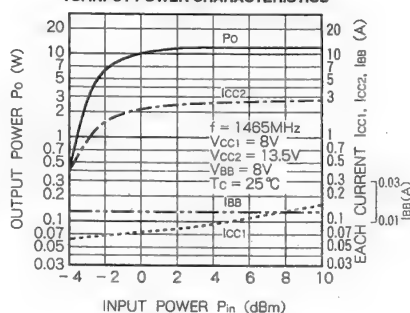
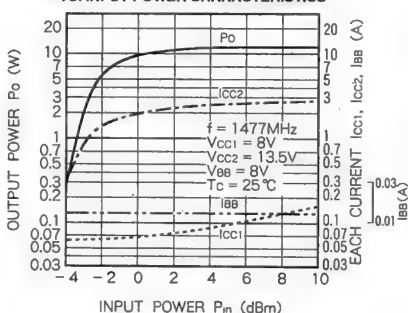
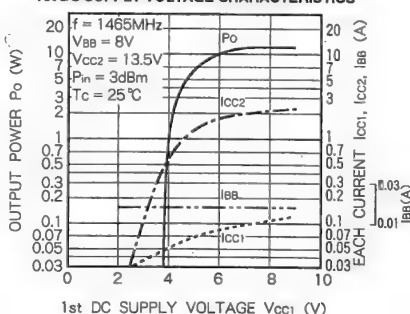
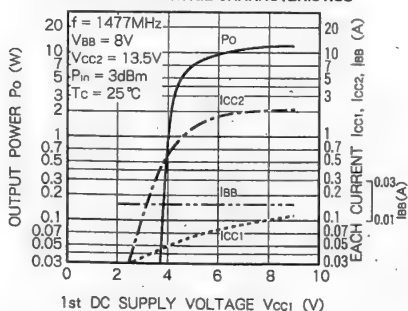
- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS DC SUPPLY
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC1}	Supply voltage		9	V
V _{CC2}			16	V
V _{BE}			8.5	V
I _{CC}	Total current		4	A
P _{in(max)}	Input power	V _{CC1} ≤ 8V, Z _G = Z _L = 50 Ω	5	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	10	W
T _{C(OP)}	Operation case temperature		-30~90	°C
T _{stg}	Storage temperature		-40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	V _{CC1} = 8V	1465	1477	MHz
P _o	Output power	V _{BB} = 8V	7.5		W
η_T	Total efficiency	V _{CC2} = 13.5V	30		%
2f _o	2nd. harmonic	P _{in} = 2mW		- 25	dB
ρ_{in}	Input VSWR	Z _o = Z _L = 50 Ω		2.8	-
-	Load VSWR tolerance	V _{BB} = 8V, V _{CC2} = 15.2V P _o = 8W (V _{CC1} : controlled) P _{in} = 2mW Load VSWR=10:1 (All phase), 5sec.	No degradation		-

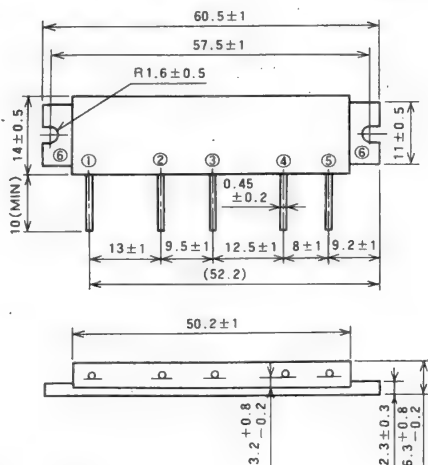
1465~1477MHz, 13.5V, 7.5W, FM MOBILE RADIO

TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY
VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, EACH CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, EACH CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
1st DC SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
1st DC SUPPLY VOLTAGE CHARACTERISTICS

OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

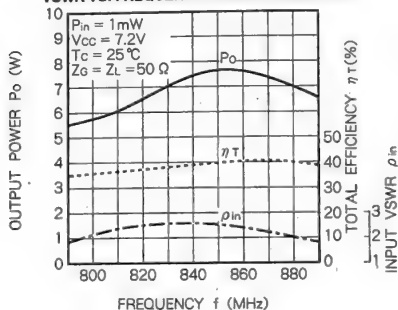
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1, 2, 3	Supply voltage		9.2	V
Icc	Total current	Z _G = Z _L = 50 Ω	4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, Vcc1 ≤ 7.2V	4	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω, Vcc1 ≤ 7.2V	8	W
T _{c(OP)}	Operation case temperature	Z _G = Z _L = 50 Ω, Vcc1 ≤ 7.2V	-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

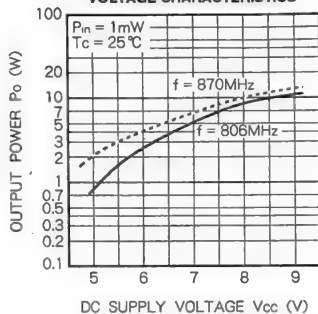
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 1mW Vcc1 = Vcc2 = Vcc3 = 7.2V Z _G = Z _L = 50 Ω	806	870	MHz
P _o	Output power		5		W
η _T	Total efficiency		30		%
2f _o	2nd. harmonic			-30	dBc
3f _o	3rd. harmonic			-30	dBc
ρ _{in}	Input VSWR			3.0	-
-	Load VSWR tolerance	Vcc2=Vcc3=9.2V, P _o =5.0W (Vcc1 controlled), Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation in output power		-

TYPICAL PERFORMANCE DATA

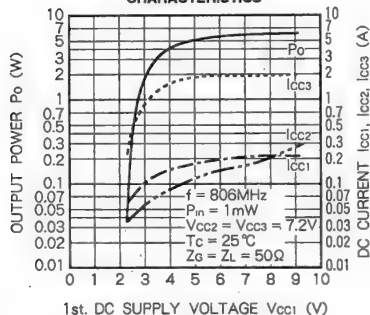
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



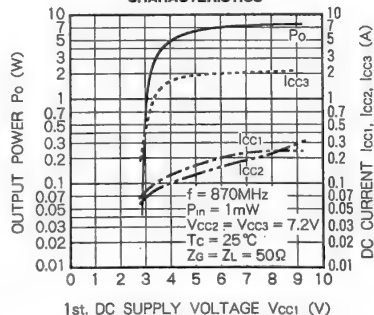
OUTPUT POWER VS. DC SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, DC CURRENT VS. 1st. DC SUPPLY VOLTAGE CHARACTERISTICS

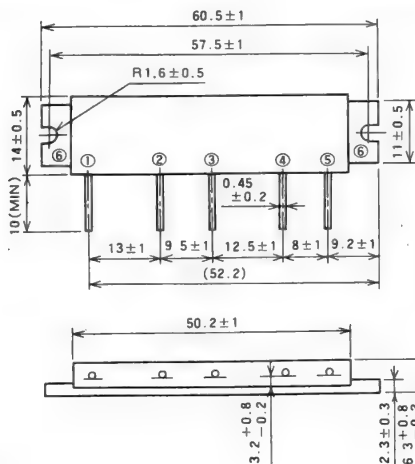


OUTPUT POWER, DC CURRENT VS. 1st. DC SUPPLY VOLTAGE CHARACTERISTICS



OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ① P_{in} : RF INPUT
- ② V_{CC1} : 1st. DC SUPPLY
- ③ V_{CC2} : 2nd. DC SUPPLY
- ④ V_{CC3} : 3rd. DC SUPPLY
- ⑤ P_o : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

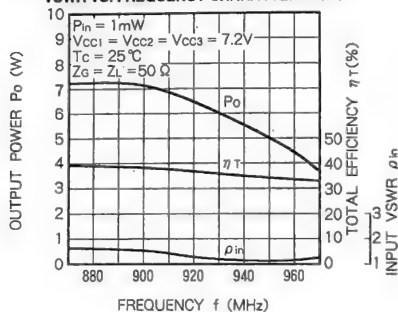
Symbol	Parameter	Conditions	Ratings	Unit
$V_{CC1, 2, 3}$	Supply voltage		9.2	V
I_{CC}	Total current	$Z_G = Z_L = 50 \Omega$	4	A
$P_{in(max)}$	Input power	$Z_G = Z_L = 50 \Omega$, $V_{CC1} \leq 7.2V$	4	mW
$P_o(max)$	Output power	$Z_G = Z_L = 50 \Omega$, $V_{CC1} \leq 7.2V$	8	W
$T_c(OP)$	Operation case temperature	$Z_G = Z_L = 50 \Omega$, $V_{CC1} \leq 7.2V$	-30~110	$^\circ\text{C}$
T_{stg}	Storage temperature		-40~110	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

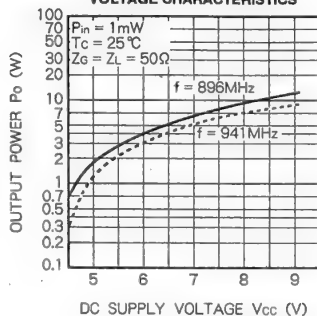
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 1\text{mW}$ $V_{CC1} = V_{CC2} = V_{CC3} = 7.2V$ $Z_G = Z_L = 50 \Omega$	896	941	MHz
P_o	Output power		5		W
η_T	Total efficiency		30		%
2fo	2nd. harmonic			-30	dBc
3fo	3rd. harmonic			-30	dBc
ρ_{in}	Input VSWR			3.0	-
-	Load VSWR tolerance	$V_{CC2} = V_{CC3} = 9.2V$, $P_o = 5.0W$ (V_{CC1} controlled), Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation in output power		-

TYPICAL PERFORMANCE DATA

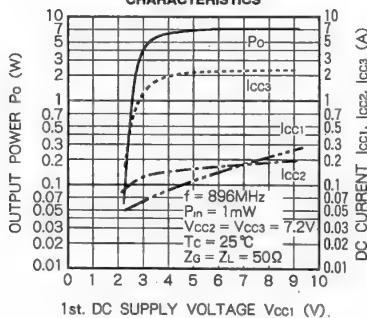
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



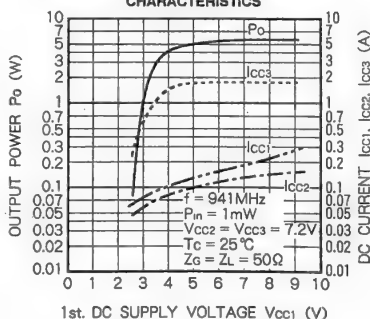
OUTPUT POWER VS. DC SUPPLY VOLTAGE CHARACTERISTICS



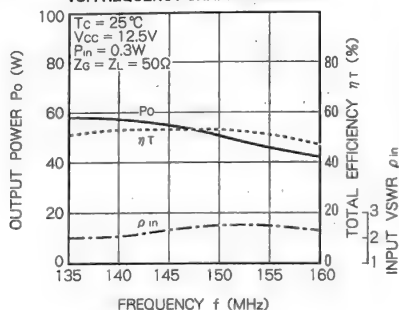
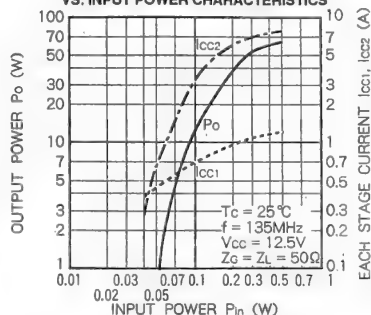
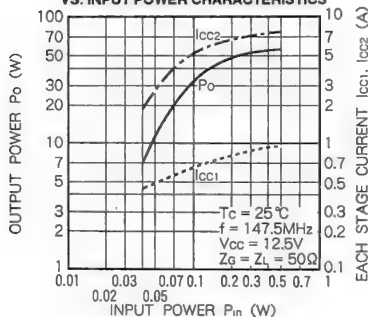
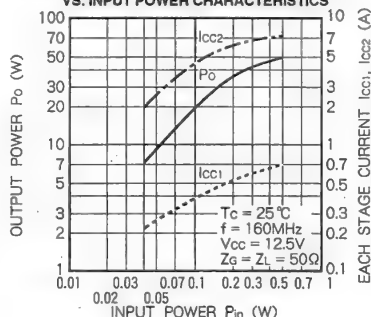
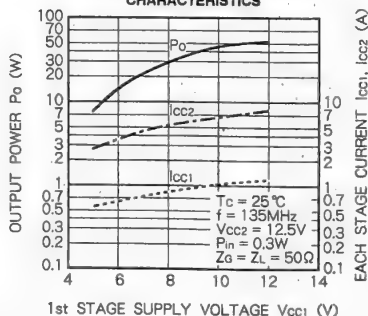
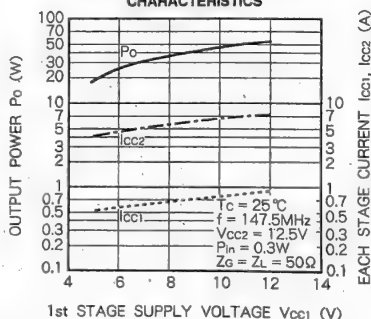
OUTPUT POWER, DC CURRENT VS. 1st. DC SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, DC CURRENT VS. 1st. DC SUPPLY VOLTAGE CHARACTERISTICS

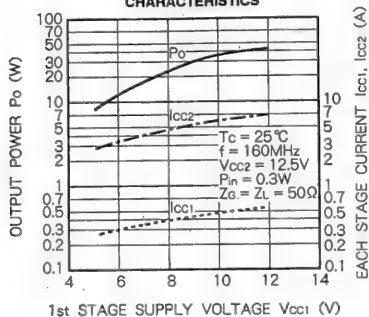


TYPICAL PERFORMANCE DATA

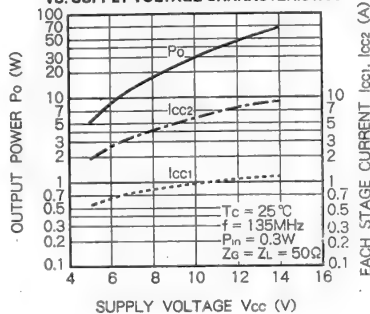
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR
VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, EACH STAGE CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, EACH STAGE CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, EACH STAGE CURRENT
VS. INPUT POWER CHARACTERISTICSOUTPUT POWER, EACH STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICSOUTPUT POWER, EACH STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS

135-160MHz, 12.5V, 40W, FM MOBILE RADIO

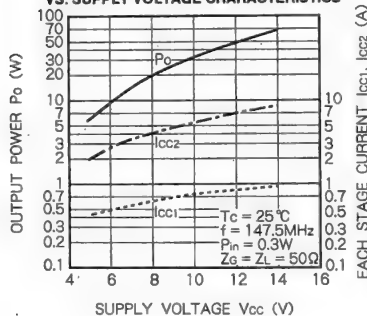
OUTPUT POWER, EACH STAGE CURRENT
VS. 1st STAGE SUPPLY VOLTAGE
CHARACTERISTICS



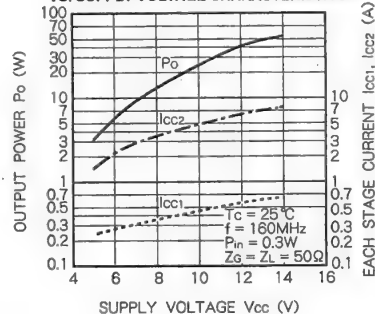
OUTPUT POWER, EACH STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, EACH STAGE CURRENT
VS. SUPPLY VOLTAGE CHARACTERISTICS

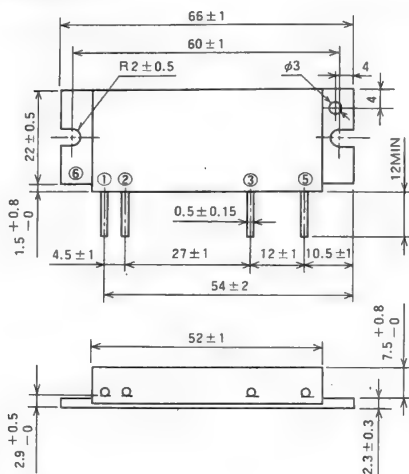


M67781H

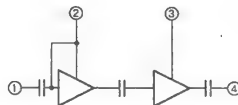
150~175MHz, 12.5V, 40W, FM MOBILE RADIO

OUTLINE DRAWING

Dimensions in mm



BLOCK DIAGRAM



PIN:

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Po : RF OUTPUT
- ⑤ GND : FIN

ABSOLUTE MAXIMUM RATINGS (T_c = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
V _{cc1}	Supply voltage		16	V
V _{cc2}			17	V
I _{cc}	Total current		12	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	0.6	W
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	50	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (T_c = 25 °C unless otherwise noted)

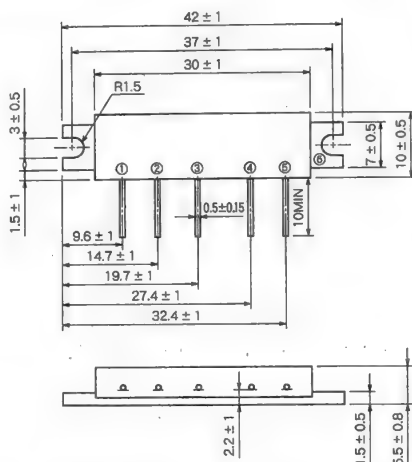
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 0.3W V _{cc} = 12.5V Z _G = Z _L = 50 Ω	150	175	MHz
P _o	Output power		40		W
η _T	Total efficiency		40		%
2f _o	2nd. harmonic			-30	dB
3f _o	3rd. harmonic			-30	dB
ρ _{in}	Input VSWR			3.0	-
-	Load VSWR tolerance	V _{cc} = 15.2V, P _o = 40W (P _{in} : controlled) Load VSWR = 8.8:1 (All phase), 5sec. Z _o = 50 Ω	No degradation		-

M67783

1240~1300MHz, 7.2V, 1.4W, FM PORTABLE RADIO

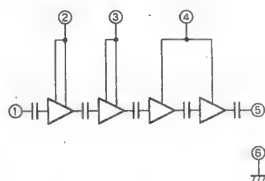
OUTLINE DRAWING

Dimensions in mm



H27

BLOCK DIAGRAM



PIN :

- ①Pin : RF INPUT
- ②Vcc1 : 1st. DC SUPPLY
- ③Vcc2 : 2nd. DC SUPPLY
- ④Vcc3 : 3rd. DC SUPPLY
- ⑤Po : RF OUTPUT
- ⑥GND : PIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

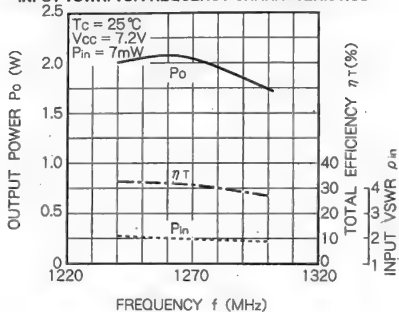
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1, 2	Supply voltage		7.5	V
Vcc3		Vcc1, 2 ≤ 7.2V	15	V
Icc	Total current		2.5	A
P _{in(max)}	Input power	Vcc1, 2 ≤ 7.2V, Z _G = Z _L = 50 Ω	10	mW
P _{O(max)}	Output power	Vcc1, 2 ≤ 7.2V, Z _G = Z _L = 50 Ω	2.5	W
Tc(OP)	Operation case temperature		-20~100	°C
T _{stg}	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

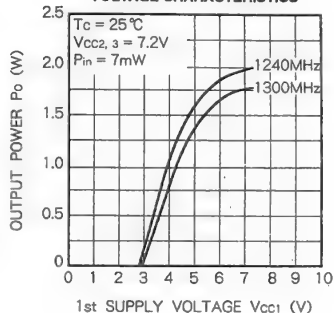
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = Vcc2 = Vcc3 = 7.2V P _{in} = 7mW Z _G = Z _L = 50 Ω	1240	1300	MHz
P _O	Output power		1.4		W
η _T	Total efficiency		20		%
2f _o	2nd. harmonic			-28	dB
ρ _{in}	Input VSWR			3.5	—
—	Load VSWR tolerance	Vcc1 = 7.2V, Vcc3 = 15V, P _{in} = 7mW P _O = 1.4W (Vcc2: controlled) Z _G = 50 Ω Load VSWR = 10:1 (All phase), 2sec.	No degradation		—

TYPICAL PERFORMANCE DATA

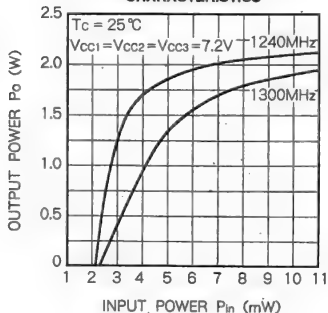
OUTPUT POWER, TOTAL EFFICIENCY,
INPUT VSWR. VS. FREQUENCY CHARACTERISTICS



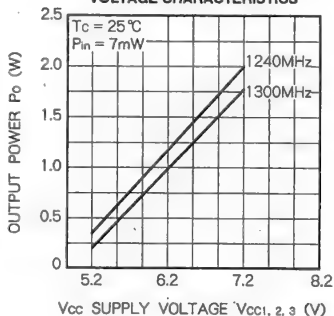
OUTPUT POWER VS. 1st SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER VS. INPUT POWER
CHARACTERISTICS



OUTPUT POWER VS. V_{cc} SUPPLY
VOLTAGE CHARACTERISTICS

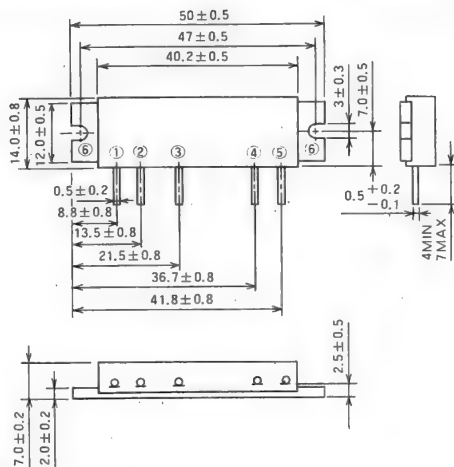


M67784

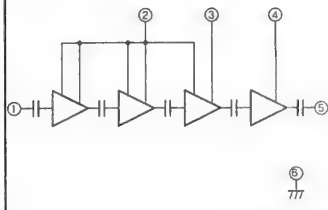
889~915MHz, 9.6V, 3.8W, FM PORTABLE RADIO

OUTLINE DRAWING

Dimensions in mm



H25

BLOCK DIAGRAM

PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

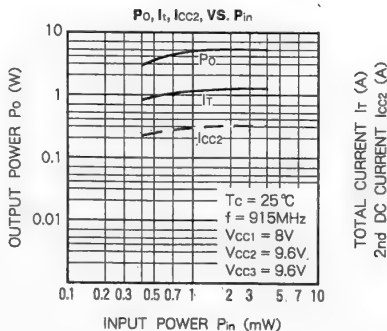
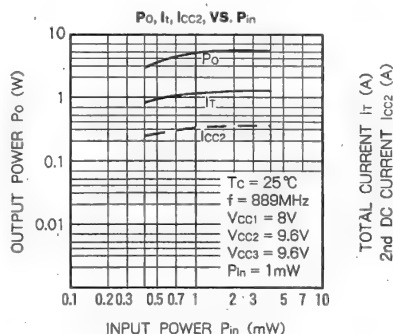
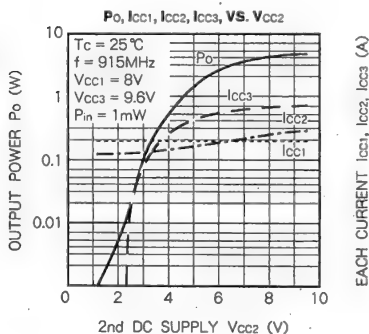
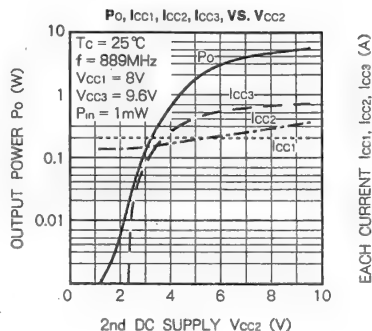
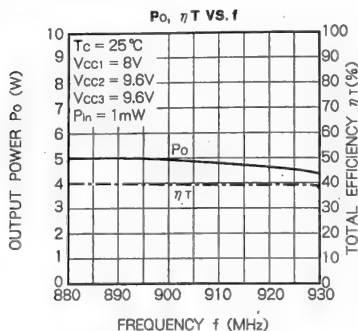
ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	Supply voltage		8.5	V
Vcc2, 3			12	V
Icc	Total current		3	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω , Vcc1 \leq 8V	10	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	6	W
T _{c(OP)}	Operation case temperature		-30~90	$^\circ\text{C}$
T _{stg}	Storage temperature		-40~110	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = 8V Vcc2 = Vcc3 = 9.6V P _{in} = 1mW Z _G = Z _L = 50 Ω	889	915	MHz
P _o	Output power		3.8		W
η_T	Total efficiency		35		%
2f _o	2nd. harmonic			-30	dB
ρ_{in}	Input VSWR			2.8	—
—	Load VSWR tolerance	Vcc1 = 8V P _o = 3.8W (Vcc2 : controlled) Vcc3 = 12V, P _{in} = 1mW Load VSWR=20:1 (All phase), 2sec.	No degradation		—

TYPICAL PERFORMANCE DATA

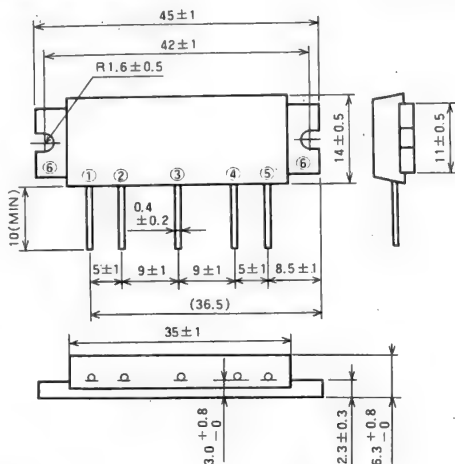


M67785

184~200MHz, 9.6V, 5W, FM PORTABLE RADIO

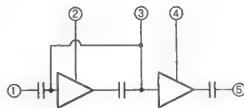
OUTLINE DRAWING

Dimensions in mm



H12

BLOCK DIAGRAM



PIN:

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vbb : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

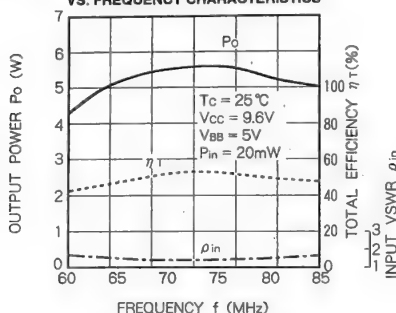
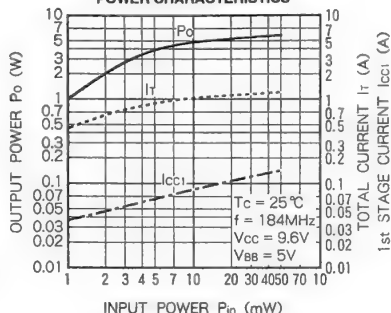
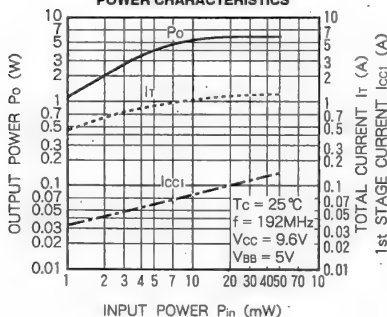
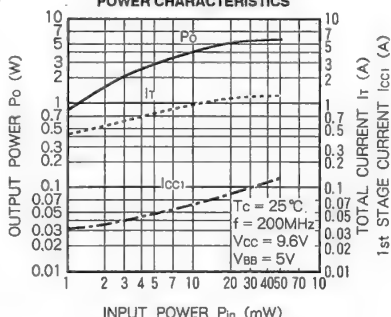
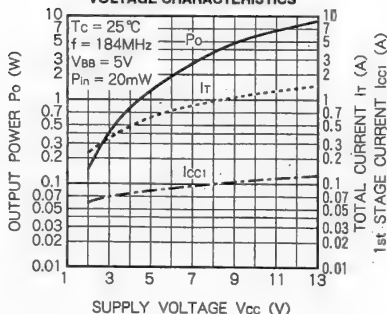
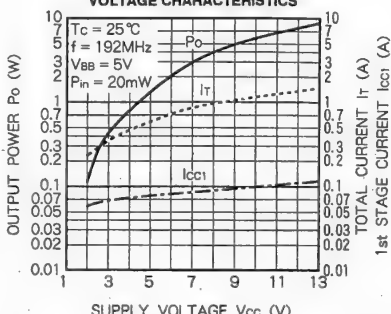
Symbol	Parameter	Conditions	Ratings	Unit
V_{cc}	Supply voltage		13	V
V_{bb}	Base bias		5.5	V
I_{cc}	Total current		4	A
$P_{in(max)}$	Input power	$Z_G = Z_L = 50 \Omega$	30	mW
$P_{o(max)}$	Output power	$Z_G = Z_L = 50 \Omega$	7	W
$T_{c(OP)}$	Operation case temperature		$-30 \sim 110$	$^\circ\text{C}$
T_{stg}	Storage temperature		$-40 \sim 110$	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range		184	200	MHz
P_o	Output power	$P_{in} = 20\text{mW}$	5		W
η_T	Total efficiency	$V_{bb} = 5\text{V}$	40		%
$2f_o$	2nd. harmonic	$V_{cc} = 9.6\text{V}$		-20	dB
$3f_o$	3rd. harmonic	$Z_G = Z_L = 50 \Omega$		-25	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	$V_{cc2} = 13\text{V}$, $V_{bb} = 5\text{V}$, $P_{in} = 20\text{mW}$ $P_o = 5\text{W}$ (V_{cc1} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_G = 50 \Omega$	No degradation		-

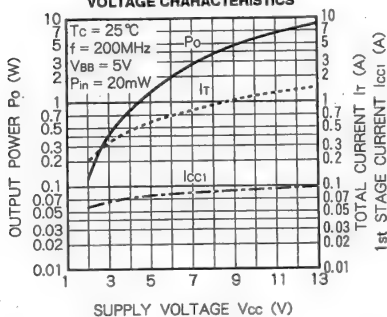
184~200MHz, 9.6V, 5W, FM PORTABLE RADIO

TYPICAL PERFORMANCE DATA

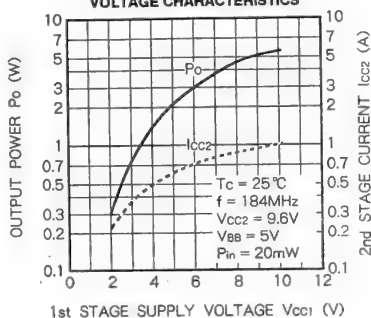
OUTPUT POWER, TOTAL EFFICIENCY, ρ_{in}
VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. INPUT
POWER CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICSOUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS

184~200MHz, 9.6V, 5W, FM PORTABLE RADIO

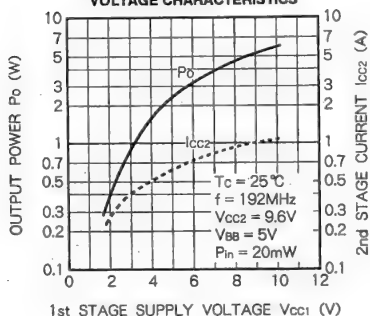
OUTPUT POWER, TOTAL CURRENT,
1st STAGE CURRENT VS. SUPPLY
VOLTAGE CHARACTERISTICS



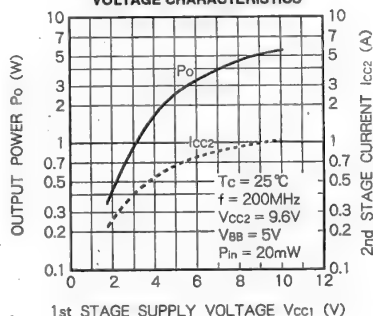
OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS

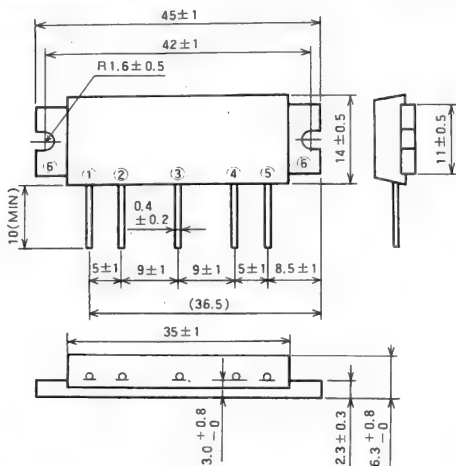


OUTPUT POWER, 2nd STAGE
CURRENT VS. 1st STAGE SUPPLY
VOLTAGE CHARACTERISTICS



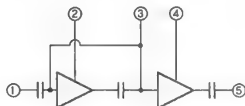
OUTLINE DRAWING

Dimensions in mm



H12

BLOCK DIAGRAM



PIN :

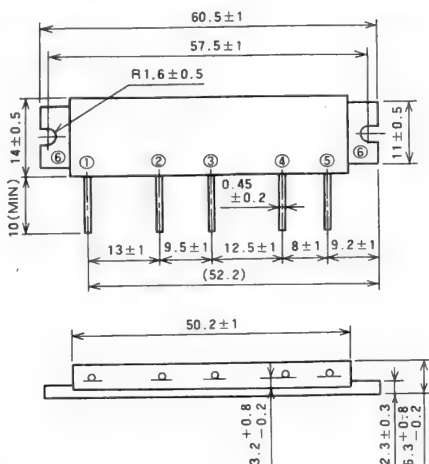
- ①Pin : RF INPUT
②Vcc1 : 1st. DC SUPPLY
③Vbb : BASE BIAS
④Vcc2 : 2nd. DC SUPPLY
⑤Po : RF OUTPUT
⑥GND : FIN

Symbol	Parameter	Conditions	Ratings	Unit
V _{CC}	Supply voltage		13	V
V _{BB}			5.5	V
I _{CC}	Total current		4	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω	30	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω	7	W
T _{c(op)}	Operation case temperature		-30~110	°C
T _{stg}	Storage temperature		-40~110	°C

Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	$P_{in} = 20\text{mW}$ $V_{AS} = 5\text{V}$ $V_{CC} = 9.6\text{V}$ $Z_0 = Z_L = 50\ \Omega$	220	240	MHz
Po	Output power		5		W
η_T	Total efficiency		40		%
2fo	2nd. harmonic			- 20	dB
3fo	3rd. harmonic			- 25	dB
ρ_{in}	Input VSWR			2.5	-
-	Load VSWR tolerance	$V_{CC2} = 13\text{V}$, $V_{AS} = 5\text{V}$, $P_{in} = 20\text{mW}$ $P_o = 5\text{W}$ (V_{CC1} : controlled) Load VSWR=20:1 (All phase), 2sec. $Z_0 = 50\ \Omega$	No degradation		-

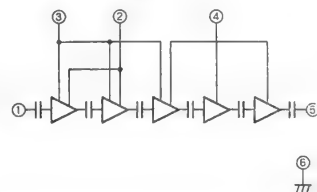
OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ VBB : BASE BIAS
- ④ Vcc2 : 2nd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

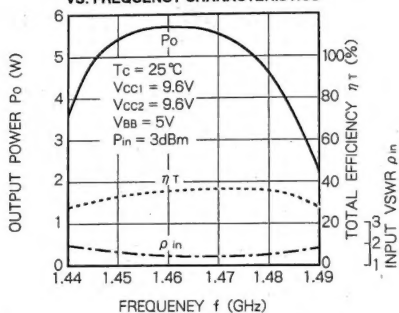
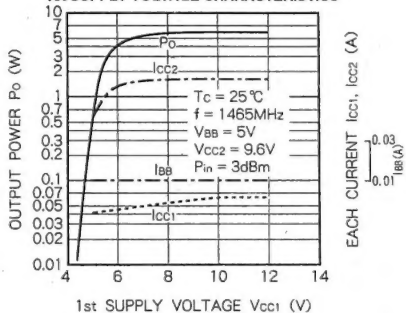
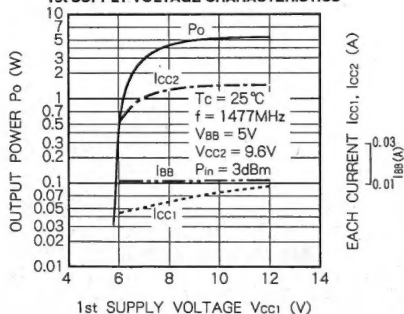
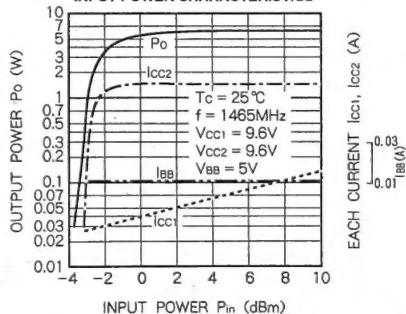
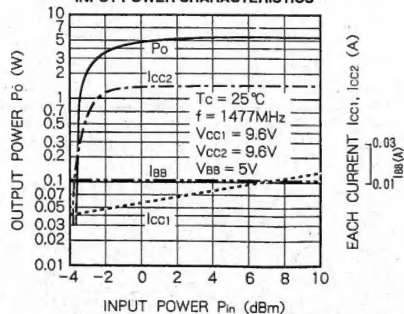
ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	Supply voltage	VBB ≤ 5.5V	12	V
Vcc2		Po ≤ 5W, VBB ≤ 5.5V, Zc = ZL = 50Ω	12	V
VBB	Total current		5.5	V
Icc			3	A
Pin(max)	Input power	Vcc1 ≤ 9.6V, VBB = 5V, Zc = ZL = 50Ω	10	mW
Po(max)	Output power	Zc = ZL = 50Ω	5	W
Tc(OP)	Operation case temperature		-30~110	°C
Tstg	Storage temperature		-40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

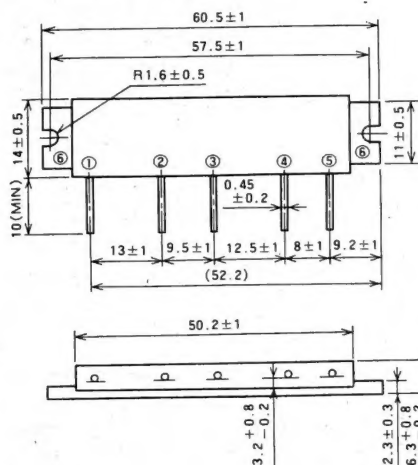
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	Vcc1 = 9.6V	1465	1477	MHz
Po	Output power	VBB = 5V, Vcc2 = 9.6V	3		W
η _T	Total efficiency	P _{in} = 2mW	30		%
2fo	2nd. harmonic	Zc = ZL = 50Ω		-25	dB
ρ _{in}	Input VSWR			2.5	—
—	Load VSWR tolerance	VBB = 5V, Vcc2 = 11V Po = 3W (Vcc1 controlled) P _{in} = 2mW, Zc = 50Ω Load VSWR = 10:1 (All phase), 5sec.	No degradation		—

TYPICAL PERFORMANCE DATA

OUTPUT POWER, TOTAL EFFICIENCY INPUT VSWR
VS. FREQUENCY CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
1st SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
1st SUPPLY VOLTAGE CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
INPUT POWER CHARACTERISTICSOUTPUT POWER, EACH CURRENT VS.
INPUT POWER CHARACTERISTICS

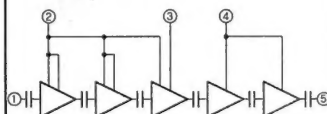
OUTLINE DRAWING

Dimensions in mm



H11

BLOCK DIAGRAM



PIN :

- ① Pin : RF INPUT
- ② Vcc1 : 1st. DC SUPPLY
- ③ Vcc2 : 2nd. DC SUPPLY
- ④ Vcc3 : 3rd. DC SUPPLY
- ⑤ Po : RF OUTPUT
- ⑥ GND : FIN

ABSOLUTE MAXIMUM RATINGS (Tc = 25°C unless otherwise noted)

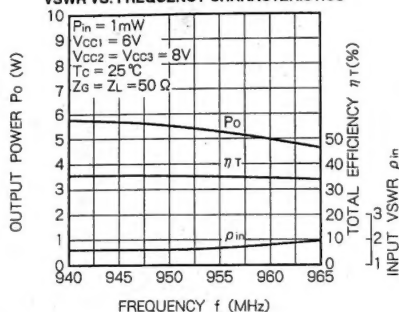
Symbol	Parameter	Conditions	Ratings	Unit
Vcc1	Supply voltage		8	V
Vcc23			10	V
Icc	Total current	Z _G = Z _L = 50 Ω	3	A
P _{in(max)}	Input power	Z _G = Z _L = 50 Ω, Vcc1 ≤ 8.0V	2	mW
P _{o(max)}	Output power	Z _G = Z _L = 50 Ω, Vcc1 ≤ 8.0V	6	W
Tc(OP)	Operation case temperature	Z _G = Z _L = 50 Ω, Vcc1 ≤ 8.0V, P _o ≤ 6.0W	- 20~80	°C
T _{stg}	Storage temperature		- 40~110	°C

ELECTRICAL CHARACTERISTICS (Tc = 25°C unless otherwise noted)

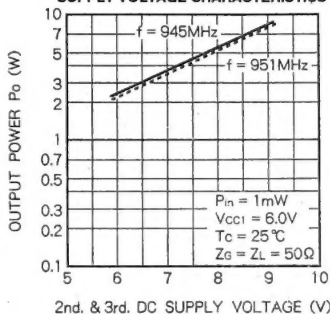
Symbol	Parameter	Test conditions	Limits		Unit
			Min	Max	
f	Frequency range	P _{in} = 1mW Vcc1 = Vcc2 = Vcc3 = 8.0V Z _G = Z _L = 50 Ω	945	951	MHz
P _o	Output power		4		W
η _T	Total efficiency		30		%
2fo, 3fo	2nd. & 3rd. harmonics			- 30	dBc
ρ _{in}	Input VSWR			3.0	-
-	Load VSWR tolerance	Vcc2-Vcc3=10.0V, P _o =5W (Vcc1 controlled), Load VSWR=20:1 (All phase), 2sec. Z _G = 50 Ω	No degradation in output power		-

TYPICAL PERFORMANCE DATA

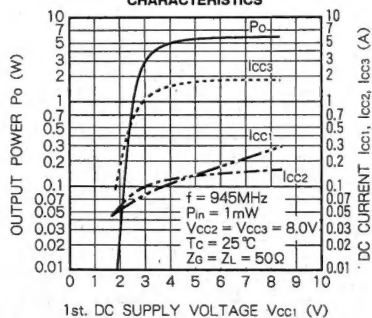
OUTPUT POWER, TOTAL EFFICIENCY, INPUT VSWR VS. FREQUENCY CHARACTERISTICS



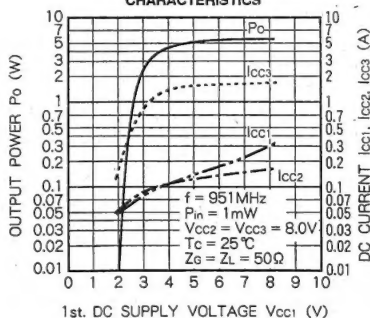
OUTPUT POWER VS. 2nd. & 3rd. DC SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, DC CURRENT VS. 1st. DC SUPPLY VOLTAGE CHARACTERISTICS



OUTPUT POWER, DC CURRENT VS. 1st. DC SUPPLY VOLTAGE CHARACTERISTICS



MITSUBISHI SEMICONDUCTORS RF POWER SEMICONDUCTORS 1993



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